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TM 11-302

WAR DEPARTMENT

U. S. Dept. of Army

TECHNICAL MANUAL

CHARGING SET SCR-169

December 10, 1941

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CHANGES No. 1

WAR DEPARTMENT,
WASHINGTON, May 12, 1943

TM 11-302, December 10, 1941, is changed as follows:

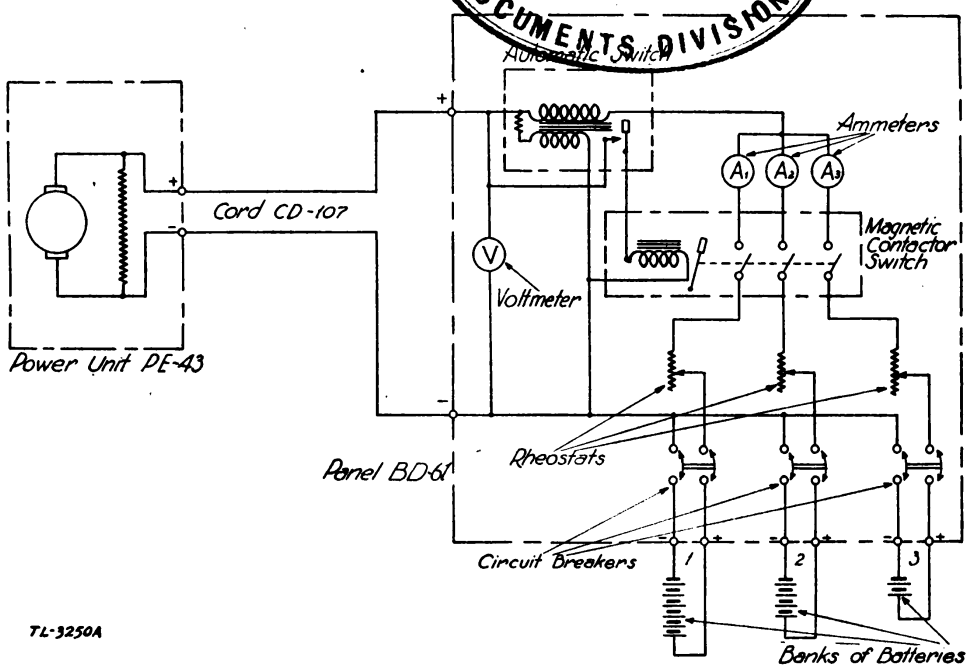

FIGURE 16.—Charging set SCR-169—circuit diagram with batteries.

[A.G. 062.11 (4-6-43).] (C 1, May 12, 1943.)

9. Maintenance and repair of power unit PE-( )-43.

* * * * * * *

a. Engine.

* * * * * * *

(2) *PE-HB-43.—(a) Lubrication.*

* * * * * * *

2. After every **50** hours of operation * * * with fresh oil. (See (3) (*a*) *2* below.)

* * * * * * *

(3) *PE-HC-43, PE-HD-43, PE-HE-43,* ***PE-HF-43, and PE-HG-43.***—(*a*) *Lubrication.*

* * * * * * *

2. After every **50** hours of operation * * * been tightened securely.

* * * * * * *

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10¼. (Added.) **Power units PE–HF–43 and PE–HG–43.**—These units are identical with power units PE–HD–43 and PE–HE–43. All information in paragraphs 1 to 10 inclusive pertaining to power units PE–HD–43 and PE–HE–43 applies to power units PE–HF–43 and PE–HG–43.

10½. (Added.) **Additional information and instructions on power units PE–HD–43, PE–HE–43, PE–HF–43, and PE–HG–43.**—*a. Ratings and capacities.*—The output ratings of these units is 550 watts at 32 volts and 17 amperes with an engine speed of 2,350 rpm. The output voltage can be varied from 30 to 40 volts by means of the throttle adjustment. It should be adjusted for 32 volts with a full load of 17 amperes (the load is the sum of the current readings on the three ammeters). Additional adjustment should not be required. The gas tank holds 1¼ gallons. Gasoline consumption is ¼ gallon per hour at full load. While it is preferable to use low test unleaded gasoline, standard issue gasoline may be used. When high test gasoline is used it may be necessary to wrap the gas line with asbestos to prevent the engine heat from causing a vapor lock in the line. When the crankcase is drained, refill it with 1 quart of SAE 20 engine oil. The oil should be changed after about every 50 hours of operation. An excellent way of keeping track of the running time is to keep a record of the amount of gasoline used. On this basis the oil should be changed after every 12 to 15 gallons of gas have been used. When adding gas to the tank, put in a quart at a time. After every 500 hours of operation (when ready for the eleventh oil change, or when 120 to 150 gallons of gas have been used) the carbon and lead should be removed and the valves ground.

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b. Internal connections of generator.—The two leads from the field coils, the two jumpers between the brush holders, the two leads to the terminal board posts, and the two panel connecting straps must be connected as shown in figure 19 to assure proper functioning of the generator, and the polarized receptacle must be installed as shown to assure proper polarity.

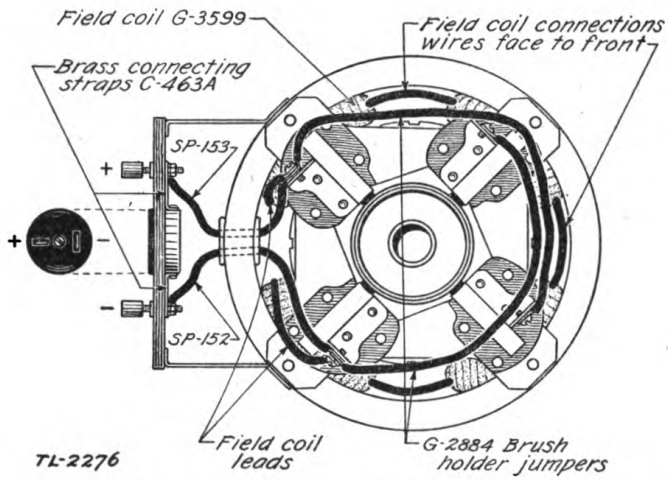

FIGURE 19.—Diagram showing internal connections of generator.

c. Generator maintenance notes.—(1) Six bolts (see fig. 20) (manufacturer's part No. 250) are used on some engines to attach the generator adapter (manufacturer's part No. C–641 L) to the engine. Note that two of the bolts are ¾ inch long and four of the bolts are ⅞ inch long. The ¾-inch bolts must be installed in the two holes at the extreme right (2 o'clock and 4 o'clock positions) when the adapter is in place against the engine. Other engines have studs (see fig. 21) mounted on the engine for attachment of the generator adapter.

(2) To remove armature (manufacturer's part No. G–3596), remove brush holder bracket assembly (manufacturer's part No. G–3731); unscrew bolt (manufacturer's part No P–4150) and remove fan; replace bolt (P–4150), screw it in about three or four turns, and tap it gently on the head with a light hammer. This will loosen the armature from the tapered engine shaft. Remove bolt and lift off armature.

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d. Engine and generator parts illustrated.—The parts for PE–HD–43, PE–HE–43, PE–HF–43, and PE–HG–43 are illustrated in figures 20, 21, and 22.

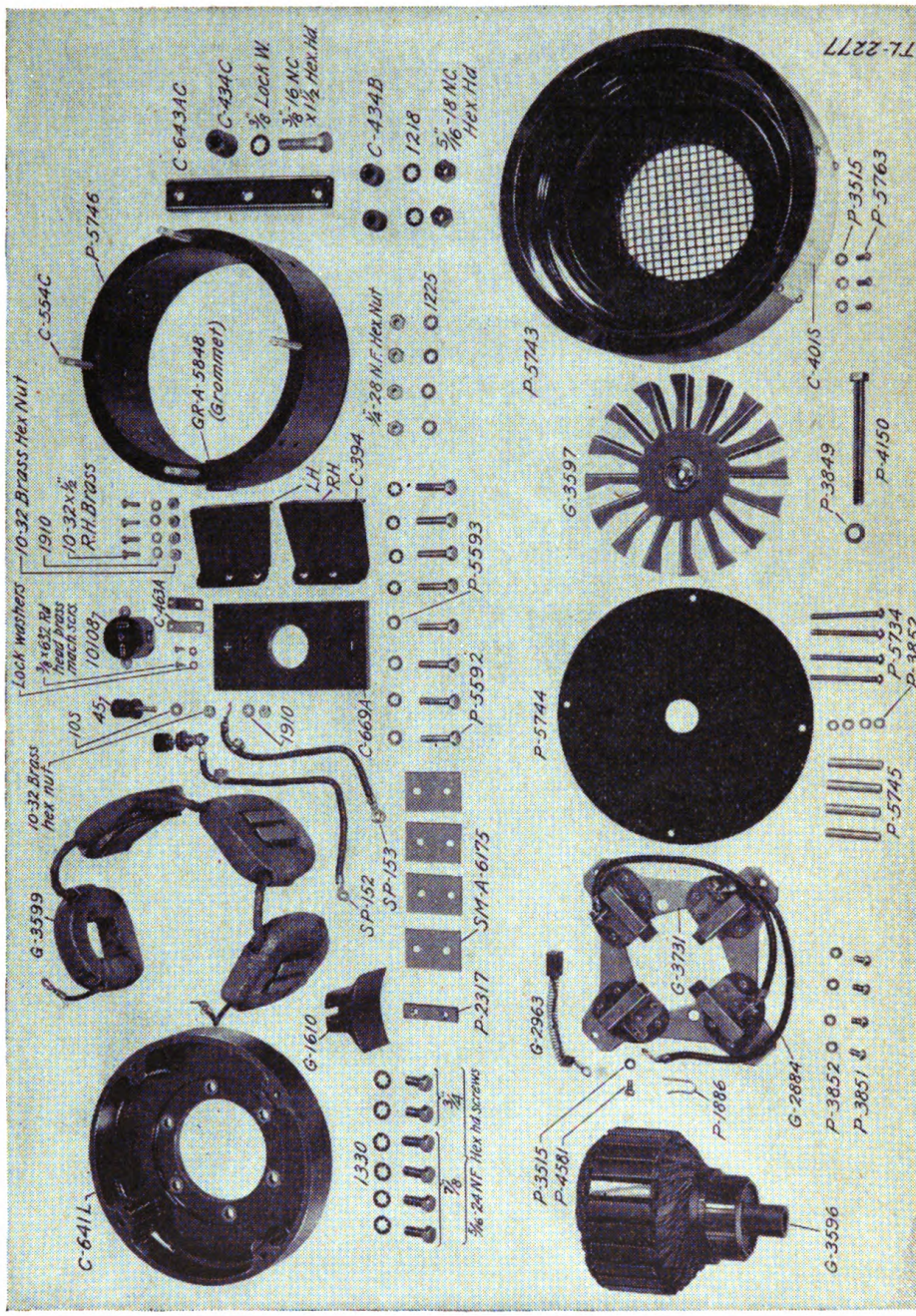

FIGURE 20.—Generator parts.

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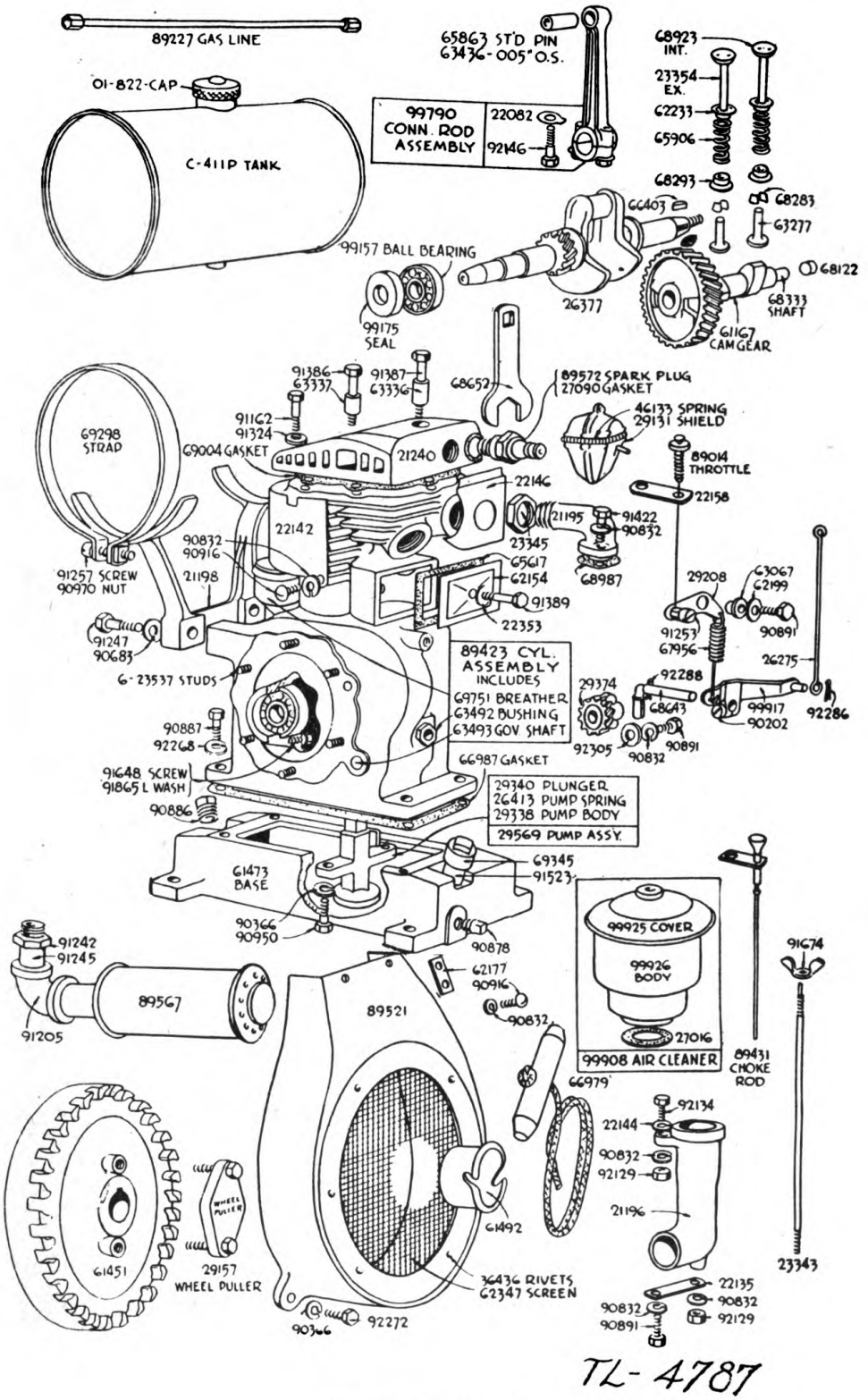

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FIGURE 21.—Engine parts.

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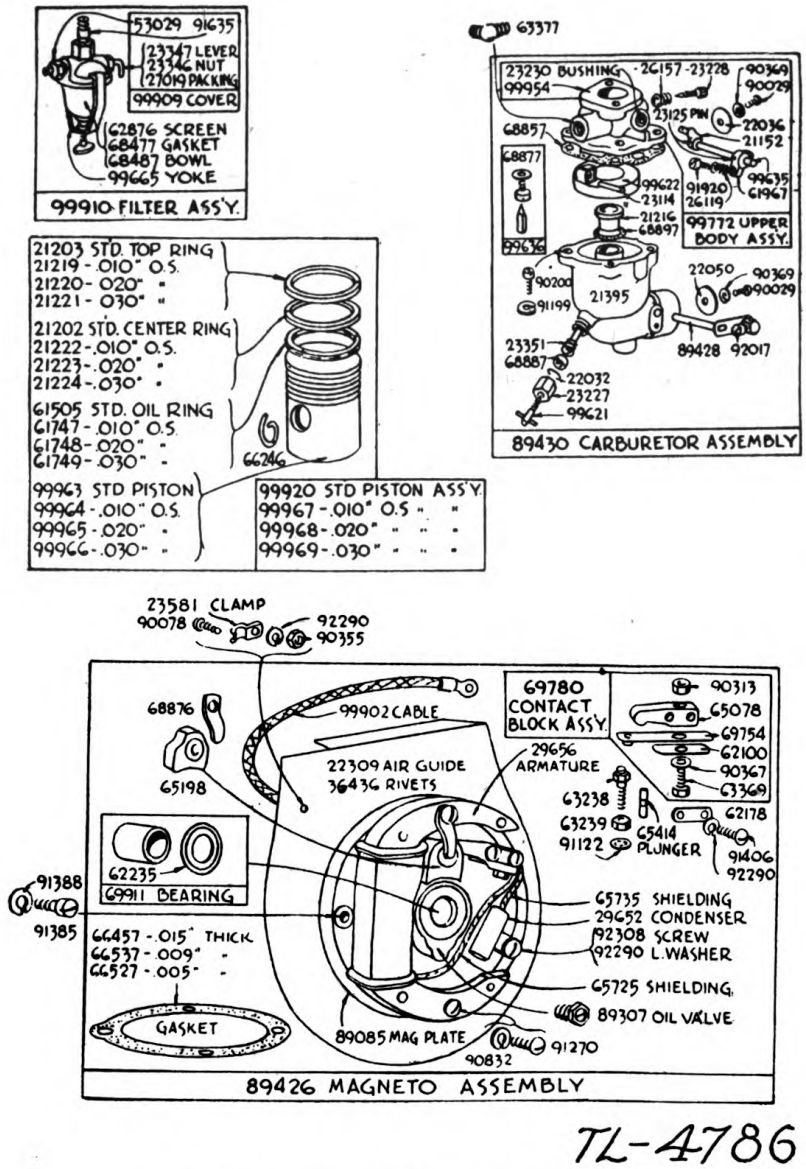

FIGURE 22.—Piston, carburetor, and magneto parts.

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11. List of replacement parts.—A list of replacement parts of power unit PE–( )–43 and panel BD–( )–61 is given below (*a* to *au*, incl.).

A	B	C	D	E	F
Item reference No.	Name of item	PE–HA–43	PE–HB–43	PE–HC–43	PE–HD–43, PE–HE–43, PE–HF–43, PE–HG–43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa
*	* *	*	*	*	*
40	Piston, oil pump		RA–366	63207	
*	* *	*	*	*	*
46	Spring, oil pump, small		RA–377	26413	26413.
46A	**Screw, 5/16"—24 x 3/4" hex. hd**				90950.
46B	**Lockwasher, 5/16", for item 46A**				90366.
47	Retainer, oil pump check ball		RA–368–A		
*	* *	*	*	*	*
59	Cylinder	11399	RA–1–F		
59A	**Tube, breather**				69751.
60	Valve, intake		RA–20–A	68923	68923.
*	* *	*	*	*	*
79	Shield, cylinder	10555		62335	22142.
79A	**Guide, air, front (intake manifold side).**				22146.
79B	**Guide, intake valve (not illustrated).**				61348.
79C	**Guide, exhaust valve (not illustrated).**				61955.
k	Louvre plate assembly		RA–1235–2		
*	* *	*	*	*	*
85	Bearing, crankshaft, ball			99157	99157.
85A	**Screw, bearing retainer**				91648.
85B	**Lockwasher, bearing retainer screw.**				91865.
86	Oil seal, crankshaft bearing			99175	99175.
*	* *	*	*	*	*
106	Plug, spark, 18 mm x 1.5 mm thread.	3H4413–7	RA–359	89572	89572.
106A	**Gasket, spark plug**				27090.
107	Screw, cylinder	10494			
*	* *	*	*	*	*
126	Lever, governor		RA–55		99917.
126A	**Pin, cotter, 1/16" x 7/8" (for item 126).**				92286.
127	Spring, governor		RA–183		
*	* *	*	*	*	*
369A	Cable, ignition (not included in assembly *aa*).			29147	29147.
369B	**Cable, ignition**				99902.
370	Brush holder, magneto	15309			
*	* *	*	*	*	*
386	Valve, oil return			89307	89307.

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A	B	C	D	E	F
Item reference No.	Name of item	PE–HA–43	PE–HB–43	PE–HC–43	PE–HD–43, PE–HE–43, PE–HF–43, PE–HG–43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa
386A	Clamp, for ignition cable on air guide.				23581.
386B	Screw, 10—32 x 5/16" round head, for cable clamp.				90078.
386C	Nut, 10—32 hex, for cable clamp screw.				90355.
386D	Lock washer, 13/64" x 1/16" x 3/64", (for items 386C and 386E).				92290.
386E	Screw, round head, contact block mounting.				91406.
386F	Rivet, for air guide				36436.
ah	Fuel tank assembly		RA–2429–1		
397	Washer, fuel tank cap		RA–311		65053 or C–589A.
405	Screw, fuel tank bracket		4–G–05	91229	91247.
407	Nut and bolt, fuel tank strap			91568	91568.
407A	Bolt 1/4"—20 x 1 1/2" round head (for item 403).				91257.
407B	Nut, 1/4"—20 square head (for item 403).				90970.
ak	Base assembly		RA–1015–5		
449	Housing, blower		RA–104–C	29098	[1] 99929 or [2] 89521.
494	Receptacle	15100		10108	10108.
494A	Standard screw, 6–32 x 3/8" round head brass, (for item 494).				
494B	Standard lock washer, for 6–32 screw (for item 494A).				
494C	Strap connection, (for item 494)				C–463–A.
495	Nut, molder terminal	15071			
500	Bracket, terminal panel, right hand.			SC–34	C–394–D.
500A	Standard screw, 10–32 x 1/2" (round head) brass machine (for items 499 and 500).				
500B	Standard nut, 10–32 brass hex. (for item 500A).				
500C	Lock washer (for item 500A)				1910.
501	Cable, negative, long	11590			SP–152.
502	Cable, positive, short	11589			SP–153.
503	Cable, regulator to terminal plate	15051			

[1] Used with PE–HD–43 and PE–HE–43.
[2] Used with PE–HF–43 and PE–HG–43.

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A	B	C	D	E	F
Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43, PE-HE-43, PE-HF-43, PE-HG-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa
505	Binding post, terminal			45	45.
505A	**Lock washer (for item 505)**				**1910.**
505B	**Washer, brass (for item 505)**				**10S.**
505C	**Standard nut, hex. 10-32 brass, (for item 505).**				
at	Armature Assembly	10758		G-3596	G-3596.
	Includes items	506, 507			
506	Armature	15155			
507	Fan and bushing assembly			G-3597	G-3597.
507A	**Bolt, fan**				**P-4150.**
507B	**Lock washer, fan bolt**				**P-3849.**
au	Field frame and coil assembly	10766			
	Includes items		508, 509		
508	Casting, field frame			P-5746	P-5746.
508A	**Studs, field frame**				**C-554-C.**
508B	**Standard nuts, 1/4"—28 NF hex. (for item 508A).**				
508C	**Lock washers (for item 508A)**				**1225.**
509	Coil assembly, field			G-3599	G-3599.
*	* *	*	*	*	*
514	Grommet, insulating			GR-A-5848	GR-A-5848.
514A	**Shim, field pole**				**SM-A-6175.**
av	Brush assembly	11476			
*	* *	*	*	*	*
517	Holder, brush	15120		G-3731	G-3731.
517A	**Screw, brush holder**				**P-3851.**
518	Screw, brush holder			P-4581	P-4581.
*	* *	*	*	*	*
532	Cover, generator			P-5743	P-5743.
532A	**Name plate, instruction**				**C-401-S.**
532B	**Standard pin, escutcheon, 14 1/4" brass.**				
532C	**Name plate, power unit**				**C-401-AS.**
533	Cover, generator end			P-5744	P-5744.
*	* *	*	*	*	*
535	Lock washer, end plate screw	10485		P-3515	**P-3852.**
535A	**Screw, end cover**				**P-5763.**
535B	**Lock washer, end cover screw**				**P-3515.**
536	Adapter, generator			P-I-550-A	C-641-L.
536A	**Stud, for mounting item 536**				**23537.**
536B	**Standard nut, 5/16"—24 N. F. hex. for item 536A.**				
536C	**Standard cap screw, 5/16"—24 hex. hd., for mounting item 536.**				
536D	**Lock washer (for item 536A or 536C).**				**1330.**
537	Screw, shell			P-5734	P-5734.
	* *	*	*	*	* *

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A	B	C	D	E	F
Item reference No.	Name of item	PE–HA–43	PE–HB–43	PE–HC–43	PE–HD–43, PE–HE–43, PE–HF–43, PE–HG–43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa
541	Skid base assembly			SC–31	[1] C–576–B or [2] C–576–J.
541A	**Support, generator**				C–643–AC.
541B	**Spacer, generator support (center)**				C–434–C.
541C	**Standard cap screw, 3/8″–16 N. C. x 1 1/2″ hex. head for item 541B.**				
541D	**Standard lock washer, 3/8″ (for item 541C).**				
541E	**Spacer, generator support (ends)**				C–434–B.
541F	**Lock washer (for item 541E)**				1218.
541G	**Standard nut, 5/16″–18 N. C. hex. head (for item 541E).**				
542	Mounting, rubber			DA–1090–70	DA–1090.
542A	**Handle, carrying "U" (see fig. 6)**				C–612–A.
542B	**Lock nut, carrying handle**				C–425–A.
542C	**Angle iron (for item 540)**				2522.
542D	**Plate, back (for item 540)**				C–567.
543	Handle, crate			2082–J–4	108.
*	* *	*	*	*	*

[A. G. 062.11 (4–6–43).] (C1, May 12, 1943.)

[1] **Used with PE–HD–43 and PE–HE–43.**

[2] **Used with PE–HF–43 and PE–HG–43.**

12. (Added.) **Tools and spare parts for power units PE–HD–43, PE–HE–43, PE–HF–43, and PE–HG–43.**—The following tools and spare parts are furnished with each of the above power units and are packed in the tool box on the skid base. The manufacturer is Climax Engineering Company, Clinton, Iowa.

1 set of tools as follows:

1 6-inch gas plier (thin nose).
1 8-inch screw driver.
1 9-inch carbon scraper.
1 $\frac{3}{8}$- by $\frac{7}{16}$-inch open-end wrench.
1 $\frac{1}{2}$- by $\frac{9}{16}$-inch open-end wrench.
1 $\frac{19}{32}$- by $\frac{11}{16}$-inch open-end wrench.
1 $\frac{5}{8}$- by $\frac{3}{4}$-inch open-end wrench.
1 29157 wheel puller.
1 1$\frac{1}{4}$-inch manifold wrench ($\frac{3}{16}$-inch thick).
1 1-inch spark plug wrench, 68652.
1 $\frac{1}{4}$-inch magneto wrench with 0.002-inch gap gages.
1 $\frac{7}{16}$-inch connecting rod wrench.

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1 set spare parts as follows:
2 89572 spark plugs (Champion type 6M)
1 29652 condenser.
1 69780 contact block assembly.
1 envelope containing—
4 G–2963 generator brushes.
1 envelope containing—
1 63238 contact point screw.
1 66987 base gasket.
1 66457 magneto plate gasket 0.015-inch thick.
1 66537 magneto plate gasket 0.009-inch thick.
1 66527 magneto plate gasket 0.005-inch thick.
1 69004 cylinder head gasket.
1 65617 valve cover plate gasket.
1 68477 gasoline filter gasket.
1 27016 air cleaner gasket.
1 68987 carburetor gasket.
1 68877 inlet valve seat gasket.
1 68897 venturi gasket.
1 68887 needle valve packing.
1 68857 carburetor body gasket.
1 69754 contact point and spring.
1 65053 gasoline tank cap gasket.
1 C–589A fuel tank cap gasket.
1 starting rope.

[A. G. 062.11 (4–6–43).] (C 1, May 12, 1943.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:
J. A. ULIO,
Major General,
The Adjutant General.

U. S. GOVERNMENT PRINTING OFFICE: 1943

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TECHNICAL MANUAL
No. 11-302

WAR DEPARTMENT,
WASHINGTON, December 10, 1941.

CHARGING SET SCR-169

Prepared under direction of the
Chief Signal Officer

	Paragraph
Use	1
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Major units	3
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Removal from service	6
Function of parts	7
Care of set	8
Maintenance and repair of power unit PE-( )-43	9
Troubles and their remedies	10
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1. Use.—The charging set SCR-169 is intended primarily to provide a portable means for charging storage batteries where an internal-combustion engine-driven generator with a d-c power output of not more than 550 watts at 32 volts is required. This set may be readily transported by truck or wagon and may be used in any location where sufficient space to install it is available.

2. Description.—Each charging set SCR-169 consists of one power unit PE-( )-43, one panel BD-( )-61, and one cord CD-107. The power unit and the panel are manufactured under the general nomenclature of power unit PE-( )-43 and panel BD-( )-61, in accordance with so-called "performance specifications" which allow the various manufacturers to furnish equipment of their own design provided certain requirements as to performance are satisfied. The parentheses in the nomenclature are replaced on name plates by code letters identifying the particular design furnished on any order, for example, PE-HC-43. These letters differentiate each design supplied under the specifications from the various other models produced. At the time of printing the following power units and panels for charging set SCR-169 have been procured: Power units PE-HA-43, PE-HB-43, PE-HC-43, PE-HD-43, and PE-HE-43; and panels BD-LL-61, BD-LM-61, BD-LN-61, BD-LO-61, and BD-LP-61. In the field when not in use the cord CD-107 is normally carried in the panel BD-( )-61; this allows the set to be carried in two sections.

a. One part is the power unit which consists of a wooden packing crate containing the engine-generator unit and a box for carrying the

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tools and spare parts, both of which are attached to a common base which also forms the bottom of the packing crate (fig. 17). The dimensions of the power units PE–( )–43 are as follows:

	Width (inches)	Length (inches)	Height (inches)	Height without crate (inches)	Weight without crate (pounds)	Weight including crate (pounds)
PE–HA–43	17¾	25¼	25⅛	21	169	185
PE–HB–43	20	25⅝	22¼	18½	110½	150
PE–HC–43	22½	20½	24	22	115	153
PE–HD–43	20⅜	22⅝	22½	20½	110	150
PE–HE–43	20⅜	22⅝	22½	20½	110	150

b. The second part is the panel BD–( )–61 which consists of a sheet steel cabinet in which is permanently mounted an insulating panel board with its electrical measuring instruments, rheostats, switches, and terminals. Dimensions of panels are approximately as follows: width, 10¼ inches; length, 22¼ inches; height, 22½ inches; and weight 100 pounds.

c. The third part is the cord CD–107 (fig.15), which is used to connect the power unit to the panel (par. 3*c*).

3. Major units.—*a. Power unit PE–( )–43.*—(1) *Power unit PE–HA–43.*—(*a*) This engine-generator unit is of commercial design, manufacturer's type *D*, manufactured by the Homelite Corporation, Port Chester, N. Y. It consists of an internal-combustion gasoline engine, generator, voltage regulator, and fuel supply tank, built as a single unit and inclosed in one case. The unit is fastened to a wooden base by shock mountings.

(*b*) The single-cylinder two-cycle engine is inverted, air-cooled, and of the removable-cylinder type. The engine develops 1½ horsepower, has a stroke of 2⅛ inches, and a bore of 2⅛ inches. The engine end of the main shaft is mounted on ball bearings. The carburetor is a commercial Tillotson type MS–52–A. Ignition is provided by means of a Bosch high-voltage magneto. The spark plug is 18 millimeters in diameter with 1½-millimeter pitch thread. No governor is used as the voltage regulator automatically controls the fuel feed. The 1-gallon fuel tank is contained in the base and provides sufficient fuel for 5 hours' operation. Constructional details of the unit are shown in figure 1.

(*c*) The six-pole shunt-wound generator and the engine are contained in the same case. The generator armature is mounted on the main shaft of the engine. The entire main shaft runs in ball bearings.

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(2) *Power unit PE-HB-43.*—(*a*) This unit is manufactured by United States Motors Corporation, Oshkosh, Wis. It is composed of a Lauson type RAY gasoline engine and a two-pole, 550-watt, 32-volt, 2,000-rpm d-c generator, manufactured by Brown and Brockmeyer Co., Dayton, Ohio. The unit is mounted on a wooden base by special rubber mountings.

(*b*) The engine is a single-cylinder, 1½-horsepower, four-cycle, L-head, air-cooled unit, with a 2¼-inch bore and a 2¼-inch stroke. It is lubricated by a supply of oil, which should be of good quality with a viscosity of SAE 20, in the crankcase. The carburetor is a float-feed type which has only one adjustment, the needle valve for fuel regulation (figs. 2 and 3). The magneto is an Eisemann model 71-M, which is incorporated in the flywheel. The governor is an inclosed mechanical type, the adjustment of which is locked by a lock nut.

(*c*) The generator is a d-c shunt-wound two-pole type with a terminal board mounted on its frame. The voltage is controlled by the operating speed of the engine.

(3) *Power unit PE-HC-43.*—(*a*) This unit is manufactured by United States Motors Corporation, Oshkosh, Wis., and is made up of a Briggs and Stratton model AP type No. 25466 gasoline engine and a 32-volt, 550-watt, 2,350 rpm generator manufactured by Pioneer Gen-E-Motor Corporation, mounted on a wooden base by special shock mountings.

(*b*) The engine is a single-cylinder, 1½ horsepower, four-cycle, L-head, air-cooled unit with a 2¼-inch bore and a 2¼-inch stroke (figs. 4 and 5). Lubrication is accomplished by means of a supply of oil, which should be of good quality with a viscosity of SAE 20, in the crankcase. The carburetor is an especially designed adjustable float-feed type. The air cleaner is to protect the engine from dust and dirt. The governor is an adjustable mechanical type, fully inclosed, which runs in oil. It has been tested and set for an operating speed of 2,350 rpm under full load. Ignition is accomplished by a magneto which together with contact points and capacitor is contained in the flywheel.

(*c*) The generator is a d-c, shunt-wound, four-pole type with a terminal panel mounted on its frame. The voltage is controlled by the operating speed of the engine.

(4) *Power units PE-HD-43 and PE-HE-43.*—(*a*) These units are identical and are manufactured by Climax Engineering Corporation, Clinton, Iowa. Each is made up of a Briggs and Stratton model AP gasoline engine and a generator manufactured by Pioneer Gen-E-

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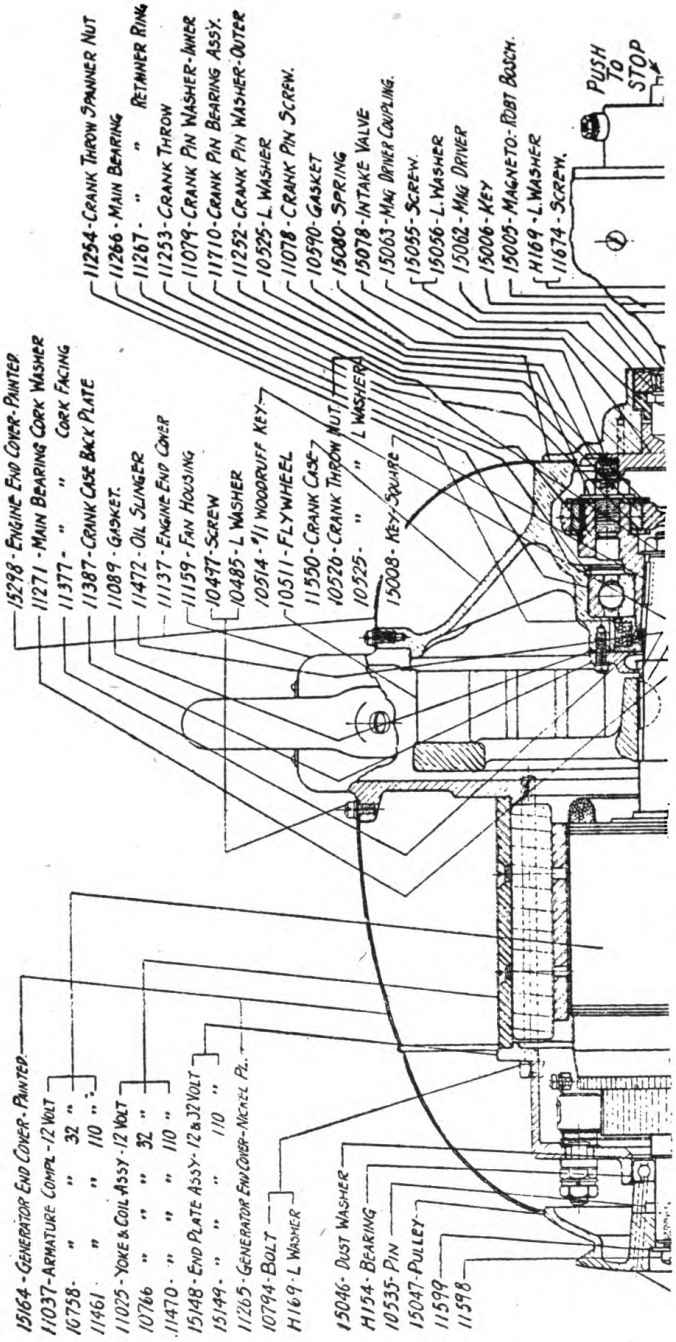

FIGURE 1.—Power unit PE–HA–43—sectional view.

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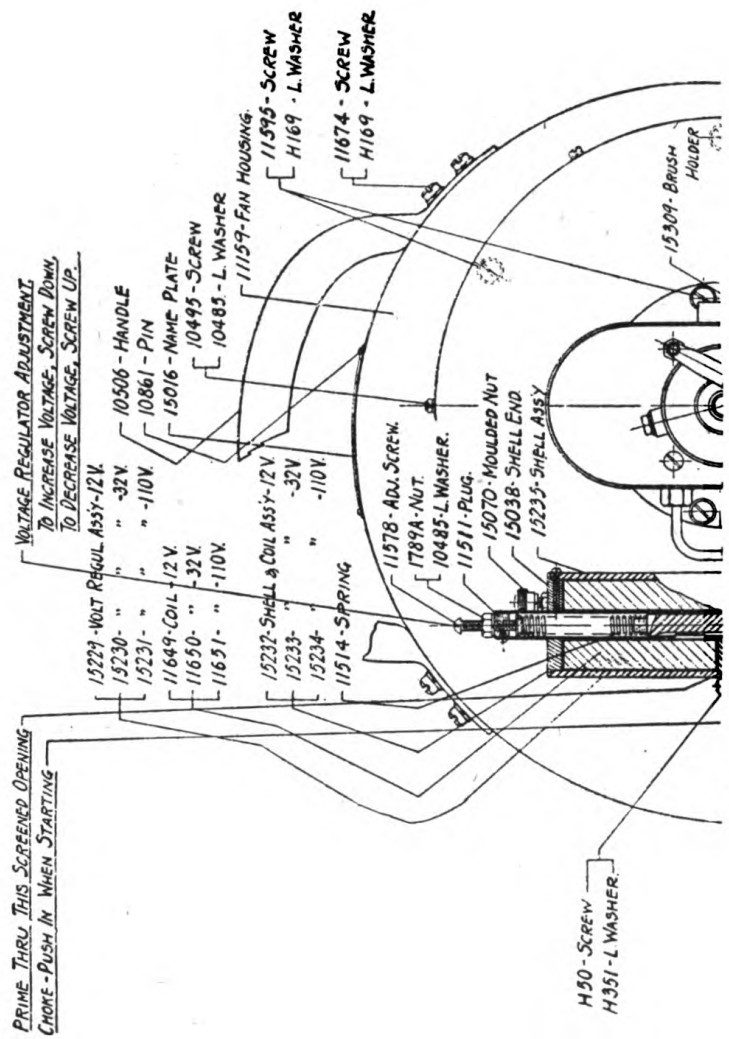

FIGURE 1.—Power unit PE-HA-43—sectional view—Continued.

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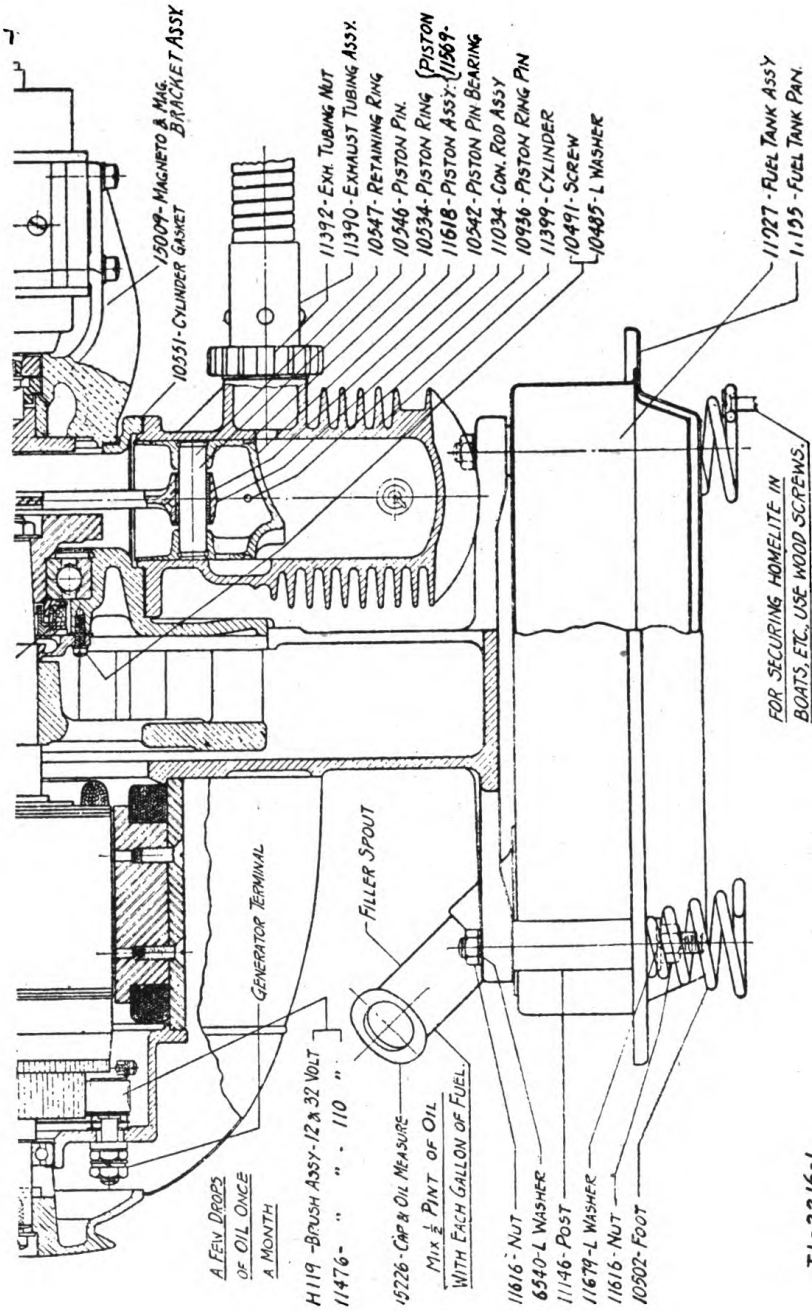

FIGURE 1.—Power unit PE-HA-43—sectional view—Continued.

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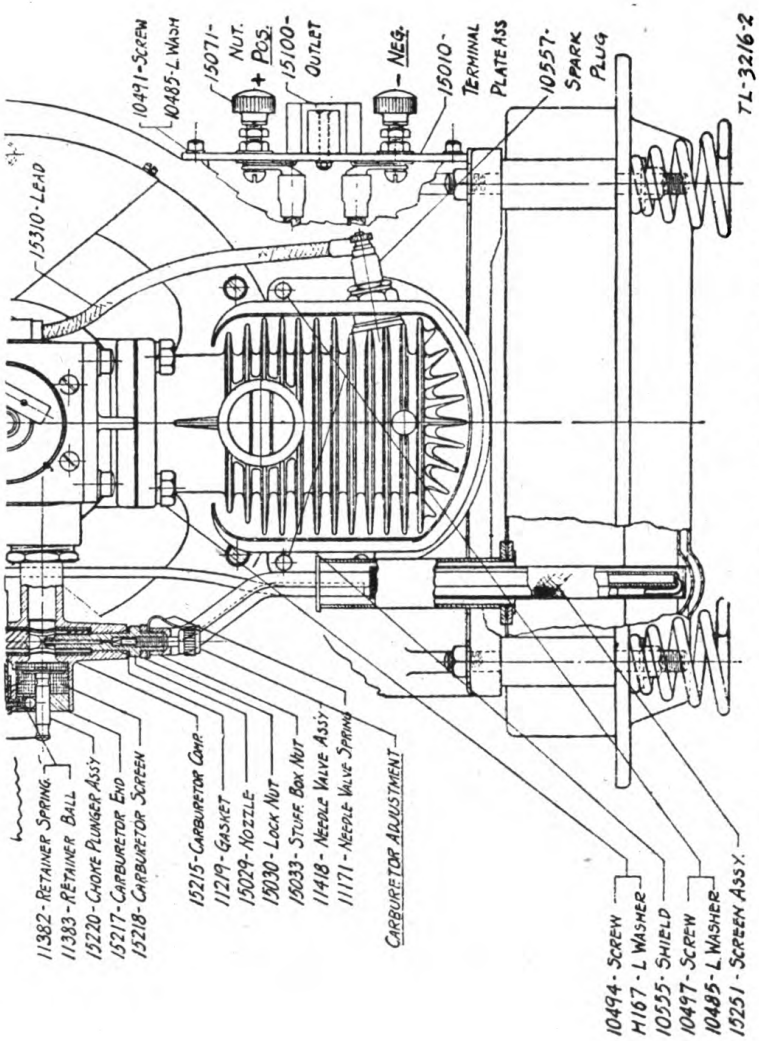

FIGURE 1.—Power unit PE-HA-43—sectional view—Continued.

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Motor Corporation, mounted on a wooden base by special shock mountings (fig. 6).

(*b*) The engine is a single-cylinder, 1½-horsepower, four-cycle, L-head, air-cooled unit with a 2¼-inch bore and a 2¼-inch stroke. Lubrication is accomplished by means of a supply of oil, which should be of good quality with a viscosity of SAE 20, in the crankcase. The carburetor is a Tillotson adjustable float-feed type. An air cleaner is used to protect the engine from dust and dirt. The governor is an

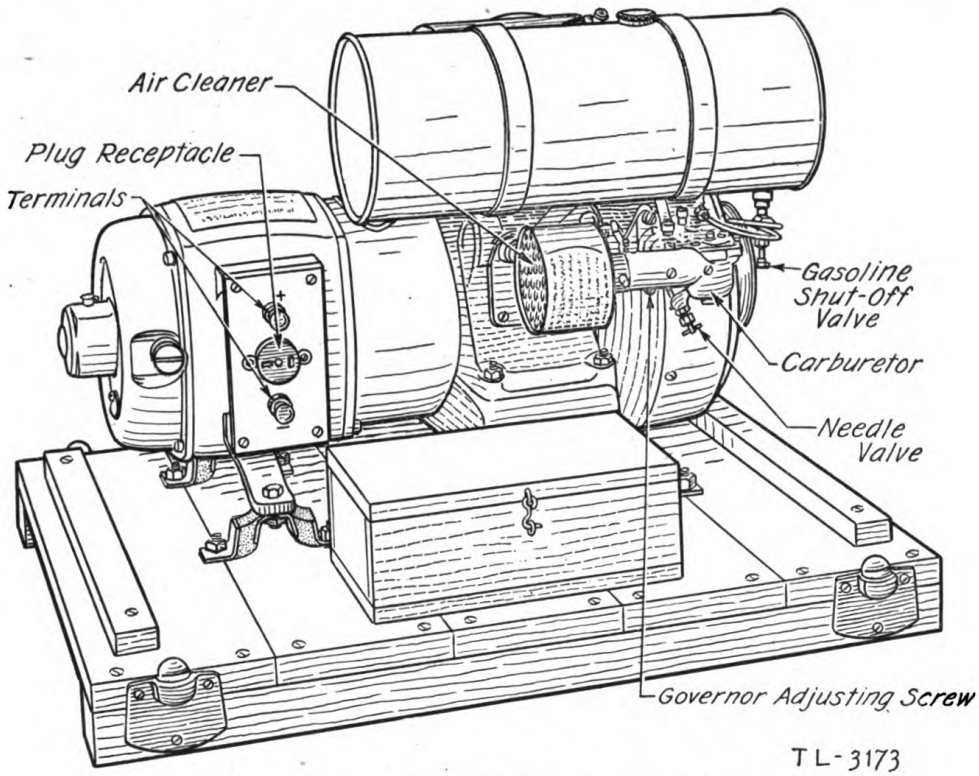

FIGURE 2.—Power unit PE–HB–43—front view.

adjustable mechanical type, fully inclosed, which runs in oil. Ignition is accomplished by a magneto which together with contact points and capacitor is contained in the flywheel.

(*c*) The generator is a d-c shunt-wound four-pole type with a terminal panel mounted on its frame. The voltage is controlled by the operating speed of the engine.

b. Panel BD–( )–61.—(1) *Panel BD–LL–61.*—The insulated panel board is made of ½-inch asbestos wood and is permanently fastened to the steel case (figs. 7 and 8). A voltmeter IF–47, 0–50 volts, direct current; three ammeters IF–16, 0–10 amperes, direct current, marked "1," "2," and "3"; a magnetic contactor switch; an auto-

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matic switch; three rheostat control handles marked "1," "2," and "3"; and three fused, double-pole, single-throw switches marked "BAT 1," "BAT 2," and "BAT 3" are mounted on the face of the panel. Three rheostats of 12.5 ohms each are mounted on the back of the insulating panel (fig. 9). The ammeter, rheostat, and switch in each circuit are marked with the same number. A circuit diagram of the panel is shown in figure 10.

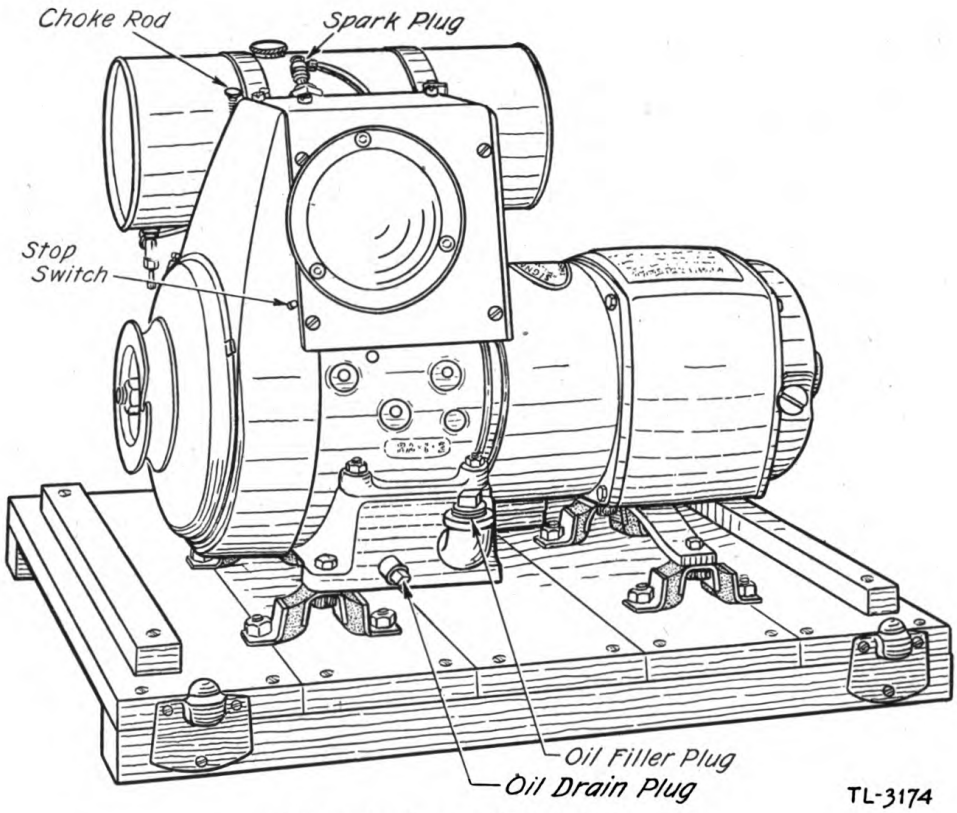

FIGURE 3.—Power unit PE–HB–43—rear view.

(2) *Panels BD–LM–61, BD–LN–61, BD–LO–61, and BD–LP–61.*—The insulated panel board is made of ½-inch black phenolic plate, fastened to the steel case (figs. 8 and 12). A voltmeter IF–47, 0–50 volts, direct current; three ammeters IF–17, 0–15 amperes, direct current, marked "1," "2," and "3"; an inclosed magnetic contactor switch; an inclosed reverse current relay (automatic switch); three rheostat control handles marked "1," "2," and "3"; and three inclosed 10-ampere double-pole single-throw circuit-breakers marked "BAT 1," "BAT 2," and "BAT 3" are mounted on the face of the panel. Three rheostats of 12.5 ohms each are mounted on the back of the panel (fig. 13). The ammeter, rheostat, and circuit-breaker in

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each circuit are marked with the same number. A circuit diagram for these panels is shown in figure 11.

c. Cord CD–107.—This cord connects the panel to the power unit as shown in figure 14. It is 15 feet long and consists of two conductors

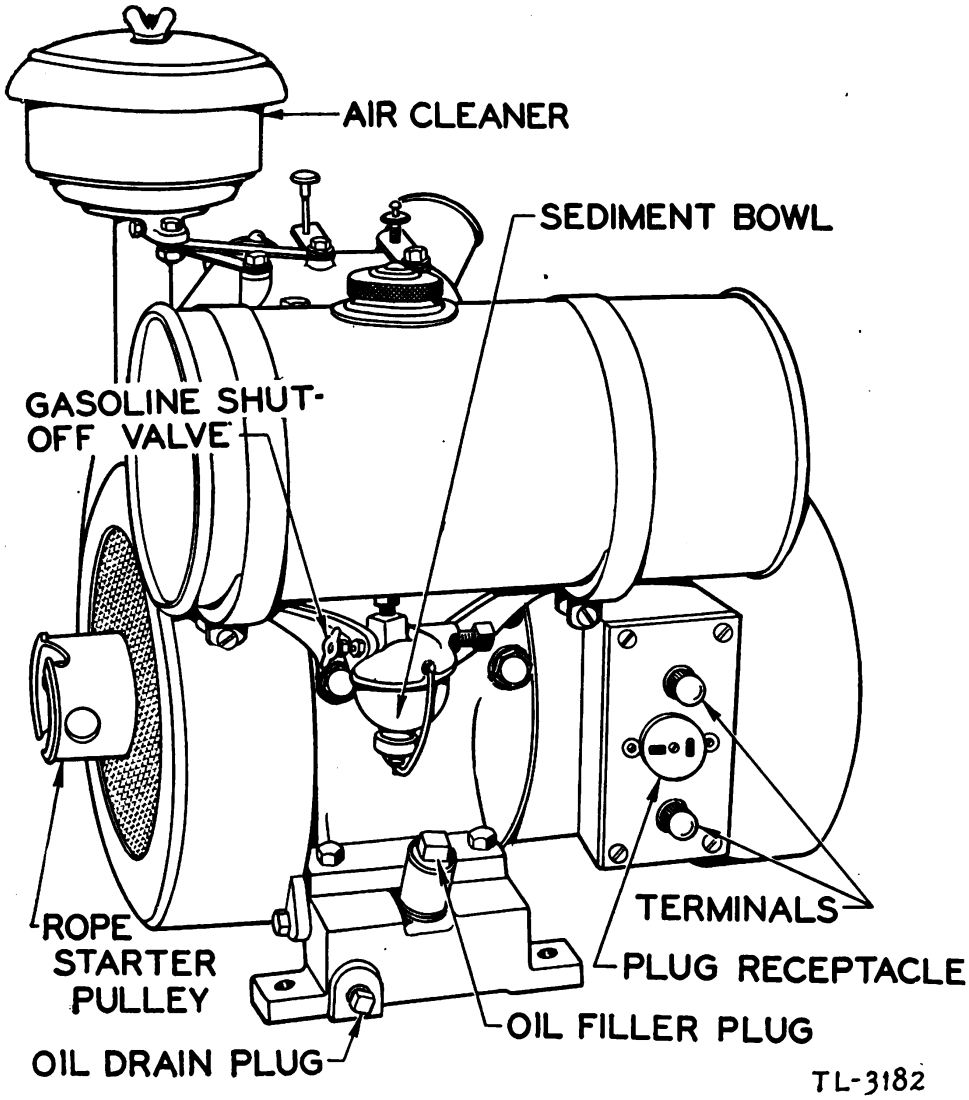

FIGURE 4.—Power unit PE–HC–43—front view.

twisted together with an outer covering of waterproof cotton braid. Latest procurements of cord CD–107 have rubber covering over the two twisted leads (fig. 15). Each conductor consists of 104 strands of No. 30 B. & S. gage annealed copper wire insulated with new code rubber and covered with a close cotton braid. One end of the cord is equipped with two hook-type terminals marked + and —, respec-

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tively. The other end of the cord is equipped with a 15-ampere polarized plug.

4. Installation for service.—*a. General.*—(1) *Transportation.*—The bulk and weight of the parts comprising this set require suitable transportation for its movement.

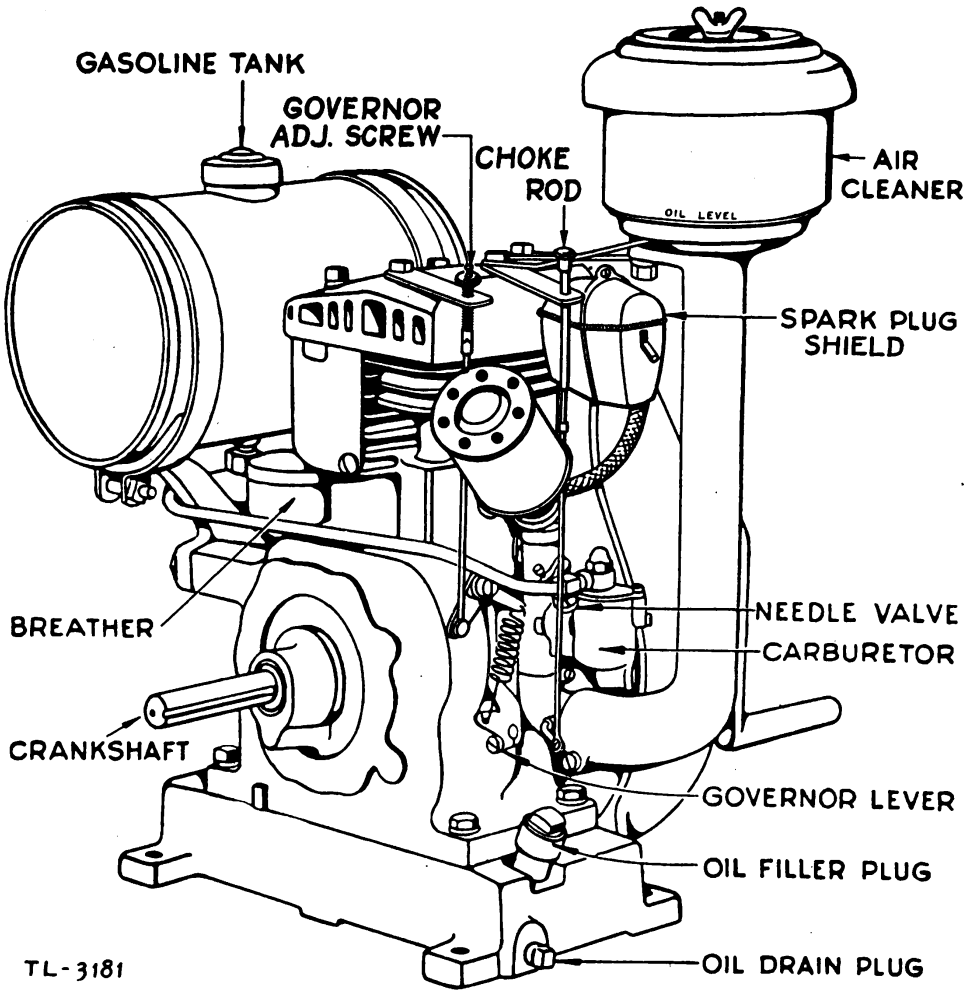

FIGURE 5.—Power unit PE-HC-43—engine details.

(2) *Personnel.*—Two men are required to unload the equipment and to set it up for operation. These men, in addition to being qualified storage battery men, should be especially trained in the care, maintenance, installation, testing, and inspecting for serviceability of the component parts of the set.

(3) *Location.*—The location of the set should be one that provides a reasonable amount of protection against the elements, is centrally

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situated with respect to the territory served by the set, and is at least 50 feet from any radio set.

b. Preparing set for service.—Reference should be made to figure 14 in connection with these instructions. Place the power unit in a level position where there is a good circulation of air. Unfasten the four trunk catches located at the bottom corners of the packing crate

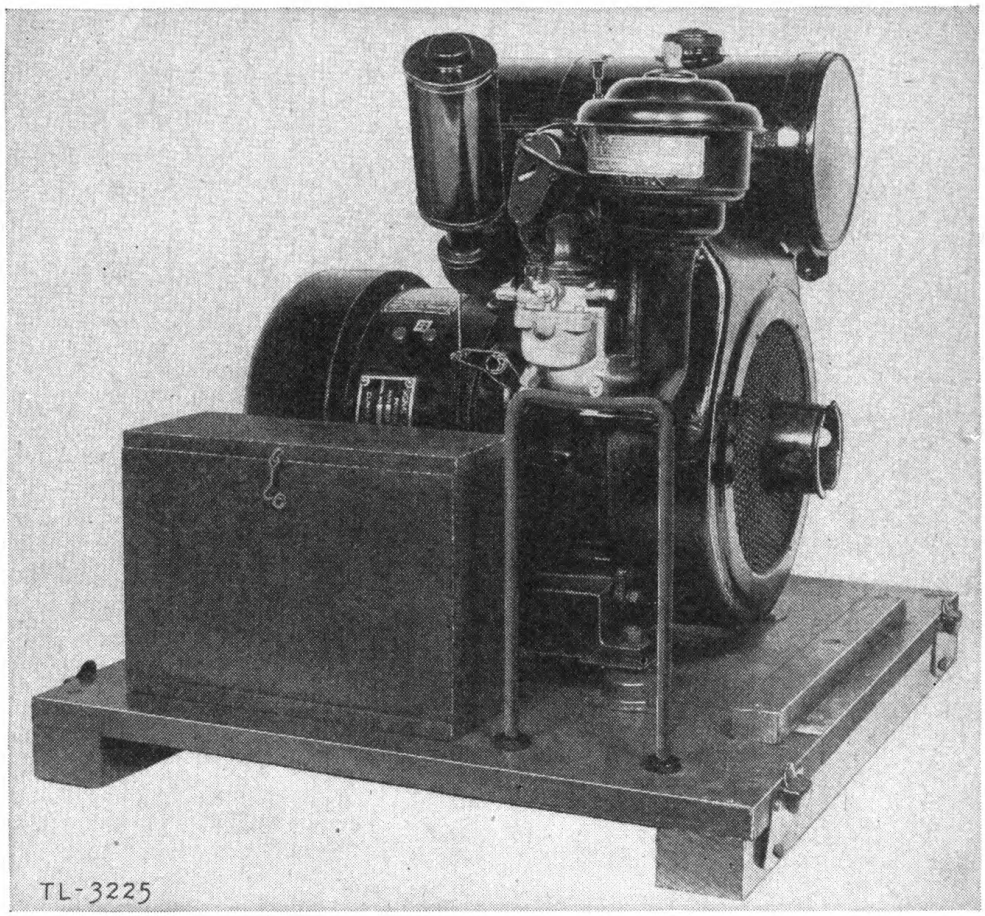

FIGURE 6.—Power unit PE-HD-43 or PE-HE-43—rear view.

and remove the top part of the crate. Place the panel in the desired position. Using the cord CD-107, connect the + and — hook-type terminals to the respective binding posts marked "GEN+" and "GEN—" located at the top of the insulated panel board. Insert the plug of the cord in the receptacle provided on the power unit PE-43. The receptacles on the various units are located as follows:

(1) PE-HA-43 in the power unit case just to the right of the spark plug.

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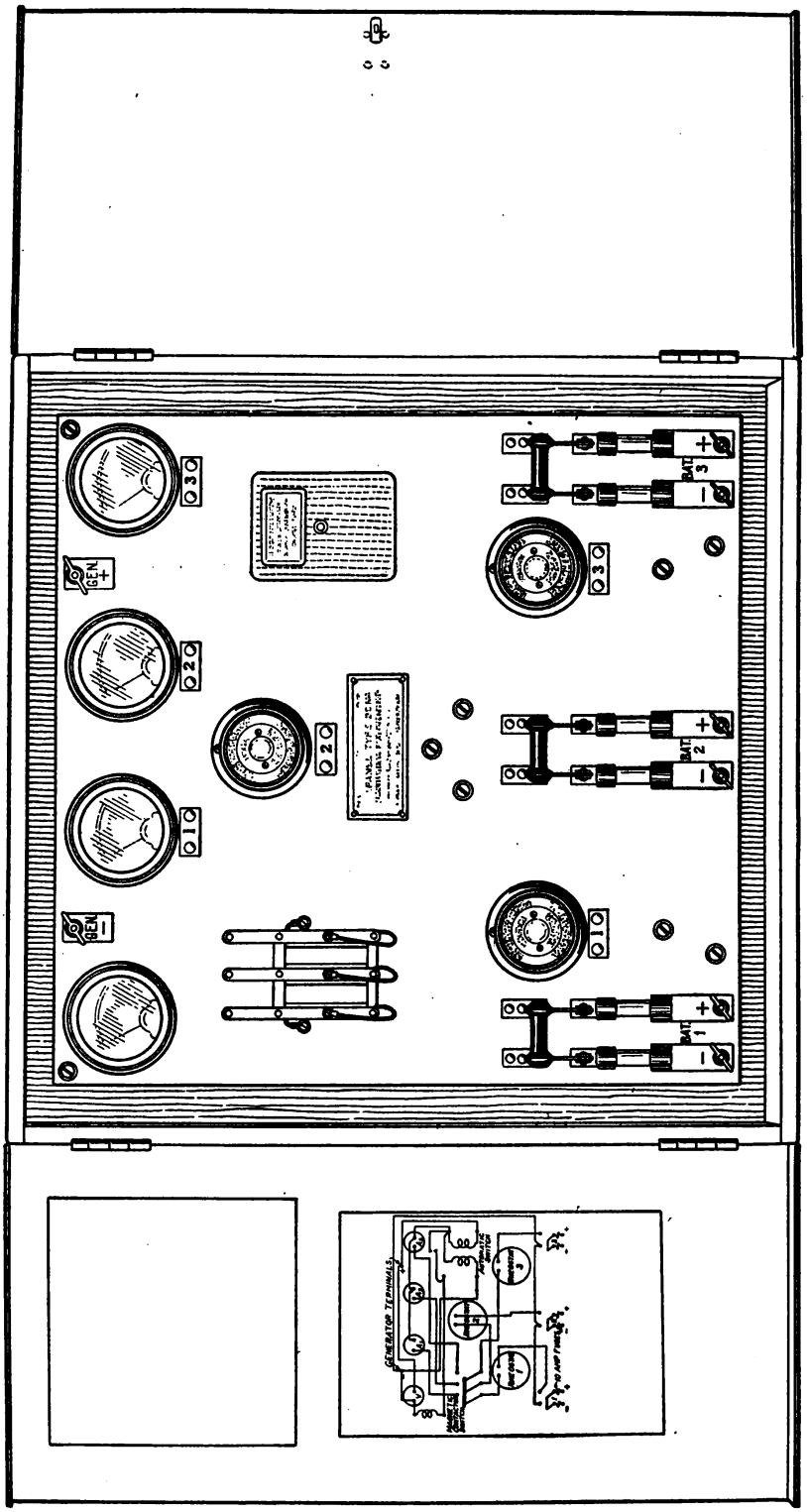

FIGURE 7.—Panel BD-LL-61—front view.

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(2) PE–HB–43, PE–HC–43, PE–HD–43, and PE–HE–43 in the terminal panel mounted on the generator frame.

c. Tests and inspections for serviceability and precautions to be observed.—(1) Before placing the set in operation see that the—

(*a*) Power unit is level and firmly seated and that the panel is upright and level.

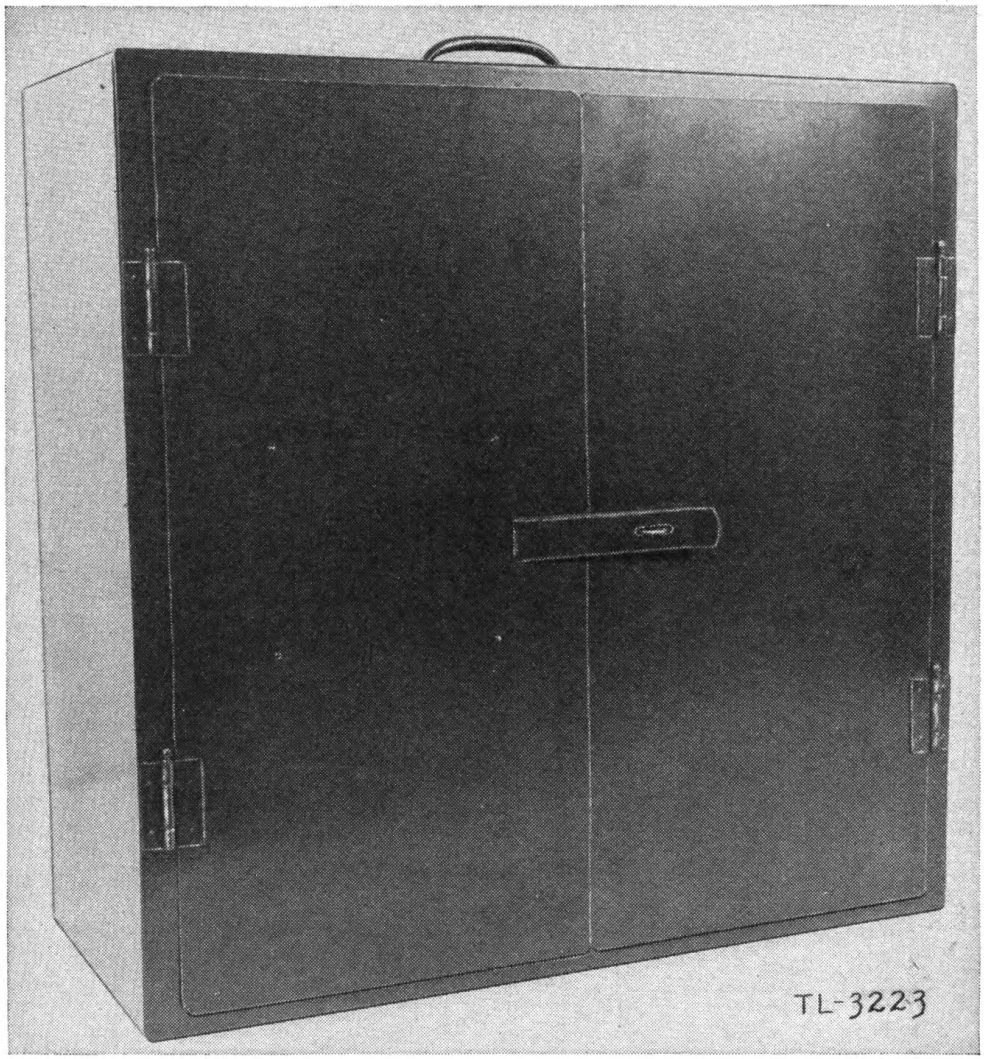

FIGURE 8.—Panel BD–( )–61 ready for shipment.

(*b*) Power unit is to operate in an area with good air circulation to prevent danger to personnel.

(*c*) Electrical connections are made with proper polarity, and that all wires are protected from each other and are so placed that personnel cannot injure themselves by accidental contact.

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(*d*) Fuel tank is filled and, if required, oil is mixed with the gasoline as specified in paragraph 5.

(*e*) Oil is up to correct level, if specified, as in paragraph 5.

(2) Remove any section of pipe or hose that may be attached to the muffler exhaust. If this is not done, the output will be reduced.

(3) Do not fill the fuel tank above the bottom of the filler spout.

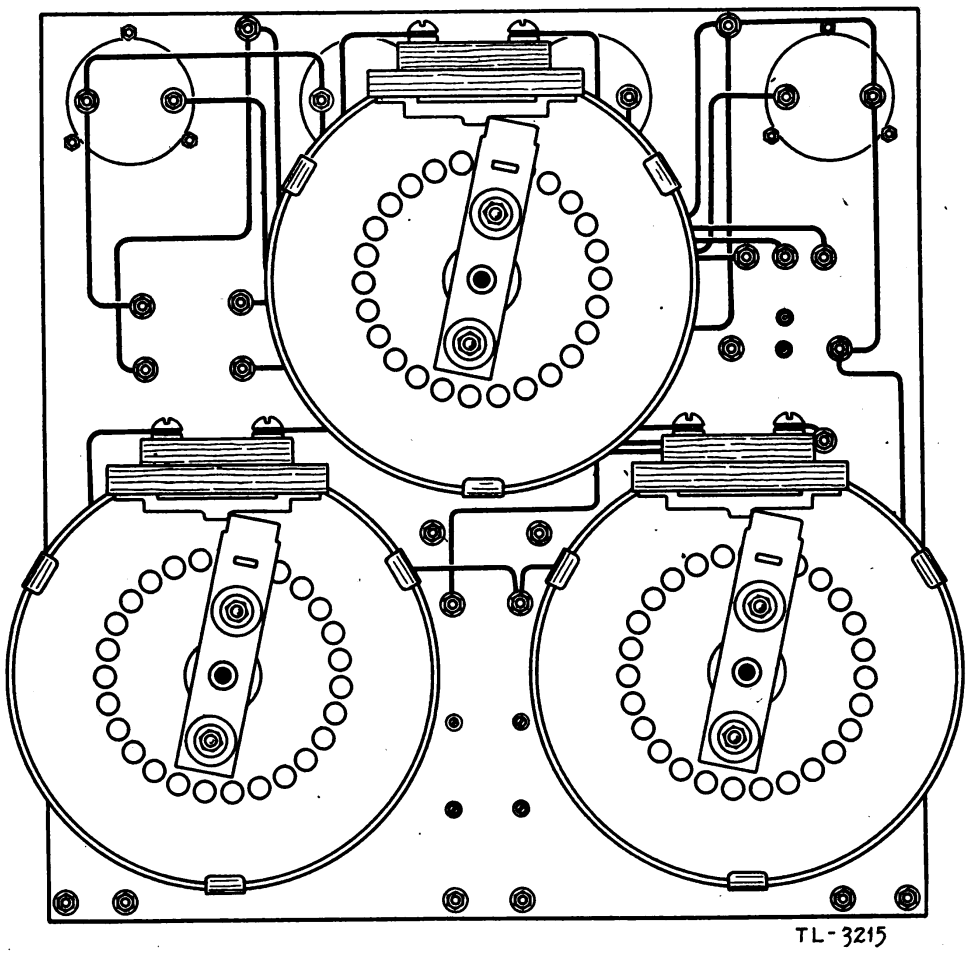

FIGURE 9.—Panel BD-LL-61—rear panel view.

(4) Do not permit fuel to run too low in the tank; fill after 3½ hours of operation to obviate the necessity of readjusting the carburetor.

(5) See that carburetor is properly adjusted for starting.

(6) Readjust the carburetor, if no governor is used, whenever the charging rate is changed.

(7) Always run the generator for about 5 minutes before connecting it to the load.

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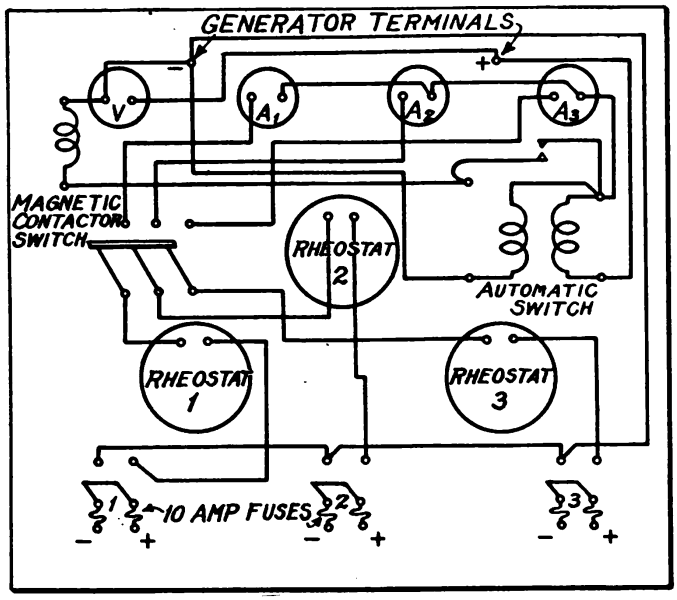

FIGURE 10.—Panel BD-LL-61—circuit diagram.

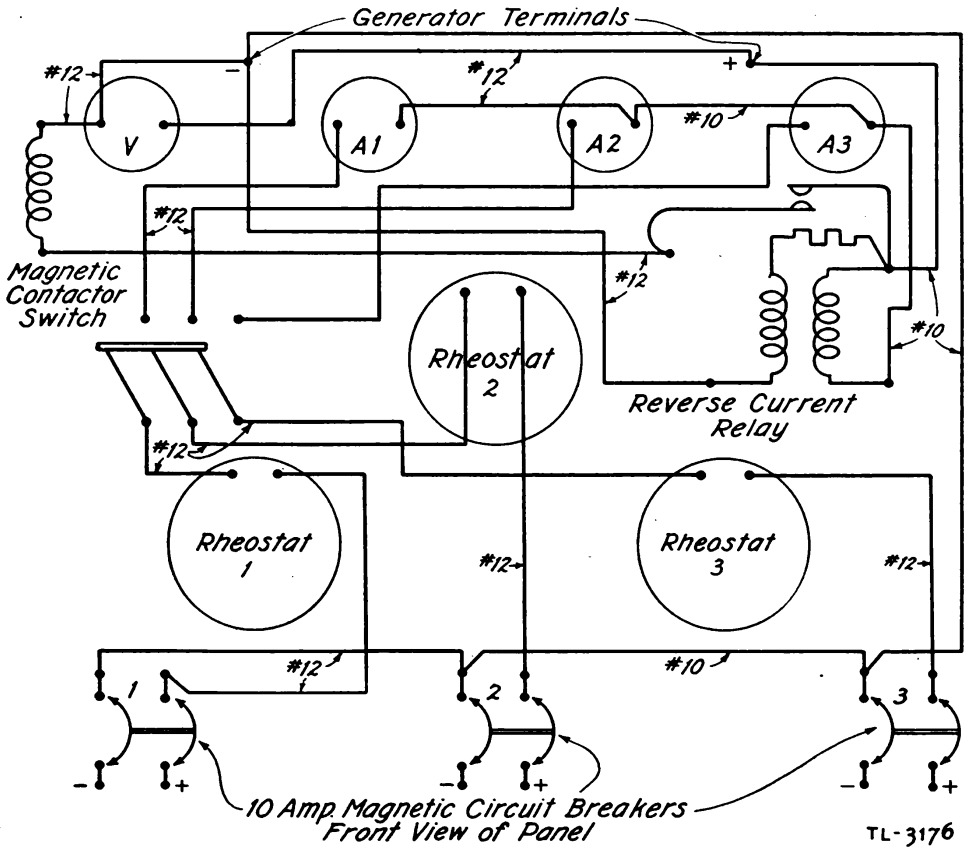

FIGURE 11.—Panel BD-LM-61, BD-LN-61, BD-LO-61, or BD-LP-61—circuit diagram.

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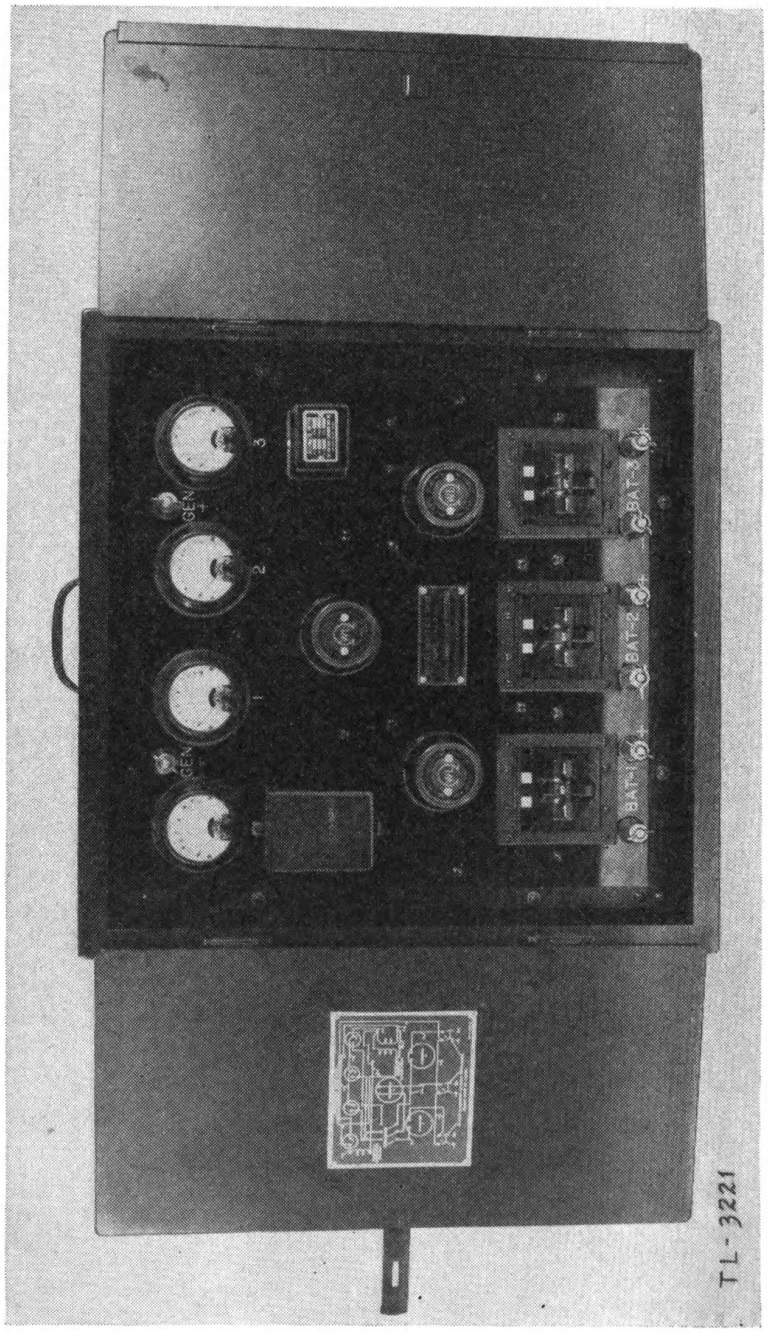

FIGURE 12.—Panel BD-LO-61—front view.

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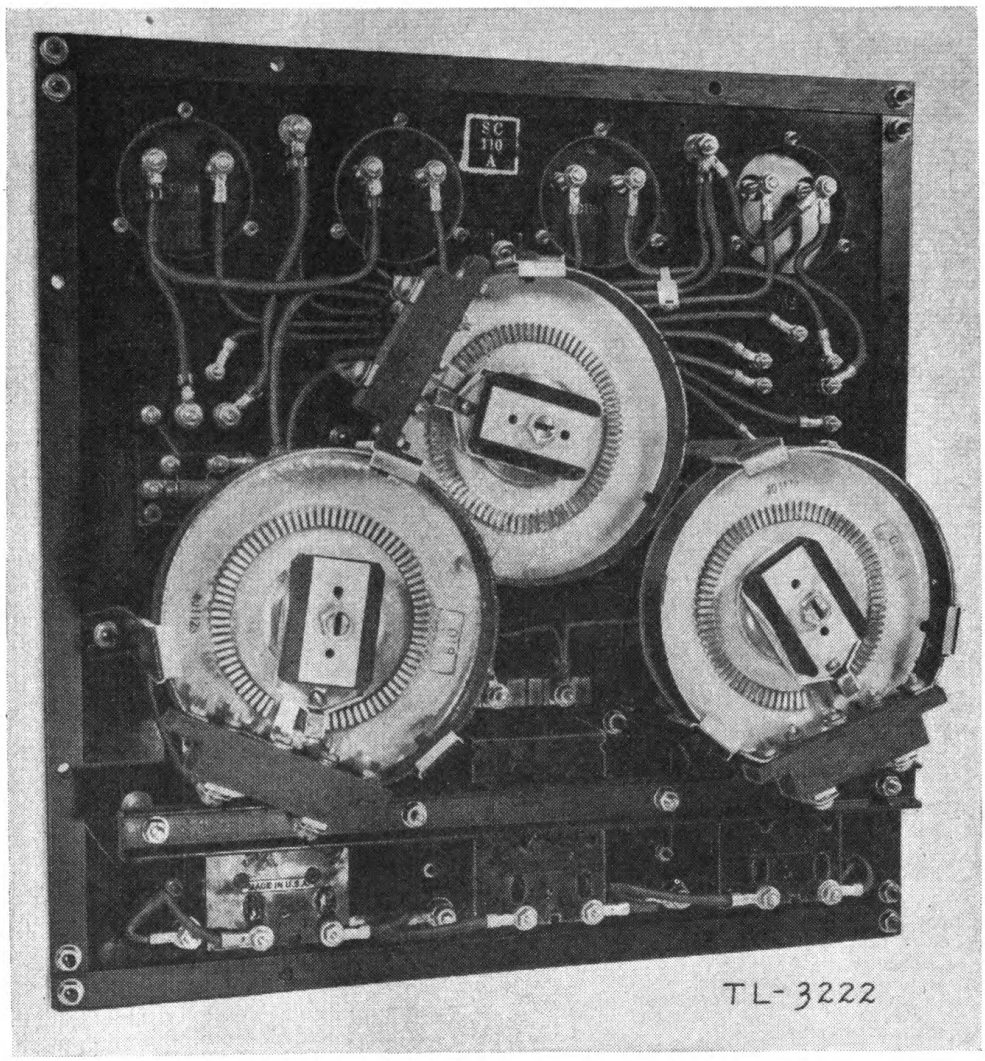

FIGURE 13.—Panel BD-LO-61—rear panel view.

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FIGURE 14.—Charging set SCR-169 set up for operation.

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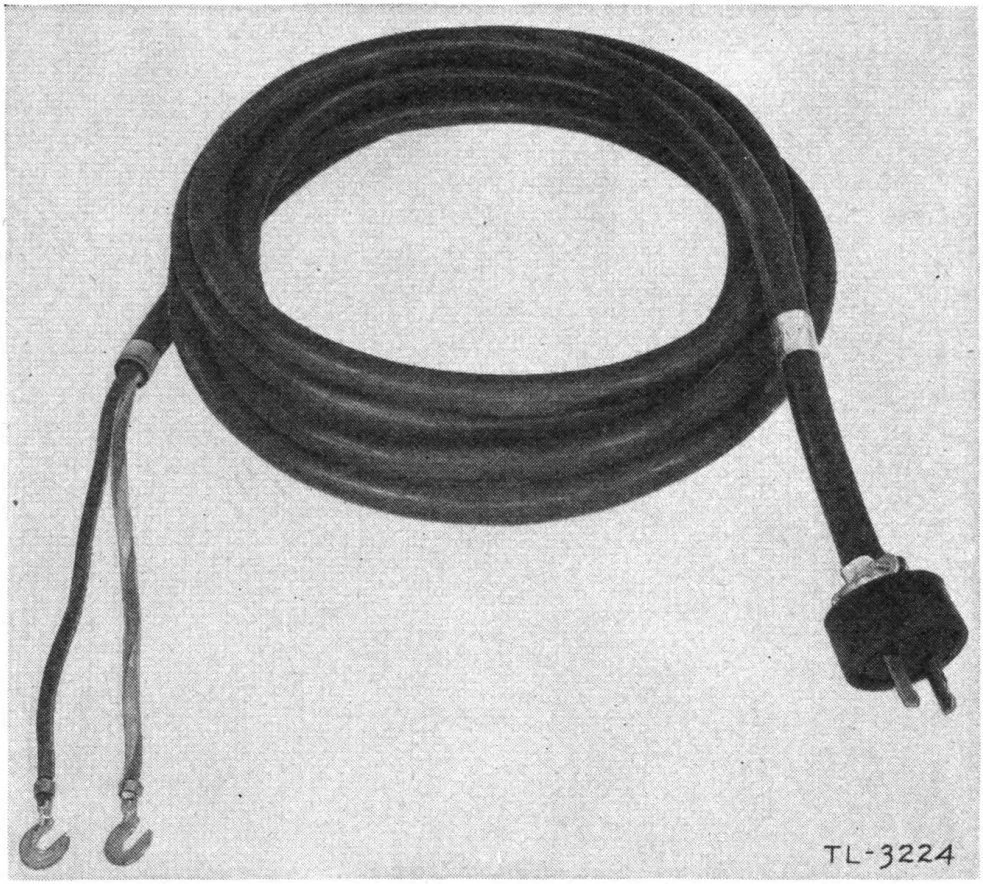

FIGURE 15.—Cord CD-107.

5. Operation.—*a. Starting and stopping engine.*—The operation of the engine is, in general, the same as that of any gasoline engine.

(1) To start the engine, proceed as follows:

(*a*) *PE–HA–43.*

1. Fill the fuel tank with gasoline and oil. Use ½ pint of SAE 40 motor oil mixed with each gallon of gasoline (par. 9*a*(1)(*a*)). Always mix the gasoline and oil before filling the tank. ***Caution:*** Do not use ethyl (red) gasoline. The slow-burning properties of ethyl gasoline cause preignition in two-cycle engines (ignition of the gasoline by the still burning exhaust gas before compression is completed) resulting in engine overheating and loss of power.

2. Pull the choke plunger out (fig. 1).

3. Insert a few drops of gasoline through the screened opening in the choke body.

4. Push the choke plunger in.

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5. Wind the starting rope clockwise on the flanged starting pulley and start the engine by pulling sharply on the rope.
6. Pull the choke plunger out when the motor starts.
7. Adjust the carburetor adjustment underneath the carburetor until the engine runs smoothly at normal operating temperature under load.

(*b*) *PE-HB-43.*

1. Fill the fuel tank with *regular* gasoline. ***Caution:*** Do not use ethyl (red) gasoline. Do not mix oil with the gasoline.
2. Fill the crankcase with a good quality oil of viscosity SAE 20 to the top of the filler fitting.

NOTE.—For heavy summer duty, involving full load conditions for long periods of time, oil of viscosity SAE 30 may be used instead of SAE 20.

3. Open the gasoline shut-off valve located on the bottom of the fuel tank at the point where the fuel line is connected to the tank (fig. 2) and allow the carburetor float chamber to fill up.
4. Slip the knotted end of the starter rope into the notch of the starter pulley and wind it around the pulley three or four times.
5. Pull the choke rod to choke the carburetor (fig. 3).
6. Pull the starter rope with a quick, steady pull to spin and start motor. The motor should start immediately and the choke should gradually be released as the engine warms up.

(*c*) *PE-HC-43, PE-HD-43, PE-HE-43.*

1. Fill the fuel tank with gasoline. ***Caution:*** Do not use ethyl (red) gasoline. Do not mix oil with the gasoline.
2. Fill the crankcase with a good quality oil of viscosity SAE 20 to the top of the filler fitting.
3. Open the gasoline shut-off valve located at the top of the sediment cup (fig. 4) and allow the carburetor float chamber to fill up.
4. Slip the knotted end of the starter rope into the notch of the starter pulley and wind it around the pulley three or four times.
5. Pull the choke rod to close the choke partly (fig. 5).
6. Pull the starter rope with a quick, steady pull to spin and start motor. The motor should start immediately and the choke should gradually be released as motor warms up.

(2) To stop the engine, proceed as follows:

(*a*) *PE-HA-43.*—Press the button on the front end of the magneto (fig. 1) and hold until the engine stops.

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(*b*) *PE–HB–43.*—Press the switch which is located in the flywheel housing near the muffler (fig. 3) and hold until the engine stops.

(*c*) *PE–HC–43, PE–HD–43, PE–HE–43.*—Press the switch which is mounted on the spark plug shield (fig. 5) and hold until engine stops.

b. Charging the batteries.—After the power unit and panel are connected by the cord as described in paragraph 4*c*, proceed as follows:

(1) Open the switches (or trip the circuit-breakers, if used) marked "BAT 1," "BAT 2," and "BAT 3" (figs. 7 and 12).

(2) Inspect all batteries in each bank to see that they are properly connected to each other.

(3) Connect the positive and negative leads from each bank of batteries to the respective + and — binding posts on the switch or switches selected. A circuit diagram of battery connections is shown in figure 16.

(4) Start the power unit.

(5) Turn all rheostat handles completely to the right.

(6) Close the battery switches or circuit breakers in use.

(7) Note the voltmeter and ammeter readings.

(8) Increase or decrease the charging current or currents to the proper rate by adjusting the rheostat or rheostats in series with the ammeters in use. Do not charge batteries at a rate exceeding 7½ amperes.

(9) Never charge more than six nor less than two batteries BB–29 or their equivalent on any one charging circuit.

6. Removal from service.—*a. Repacking for transportation in field.*—To repack the set for transportation after it has been in operation in the field, proceed as follows: Open the switches (or trip the circuit-breakers, if used) marked "BAT 1," "BAT 2," and "BAT 3"; remove the leads from the banks of batteries; remove the connecting cord from the power unit and neatly roll it to fit inside the panel case; close the panel case; place the top of the packing crate over the power unit and fasten it by means of the four trunk bolts (fig. 17).

b. Preparation for storage.—Before placing the charging set in storage, check all parts for serviceability and repair or replace parts if necessary. Cover all metal tools and spare parts with cosmoline and cover all unpainted metal parts of the power unit with a light oil. Drain all gasoline and oil from the power unit. Take care that no oil gets on the electrical wiring. Check with the list of parts in paragraph 11 to see that no parts of the set are missing or are in excess.

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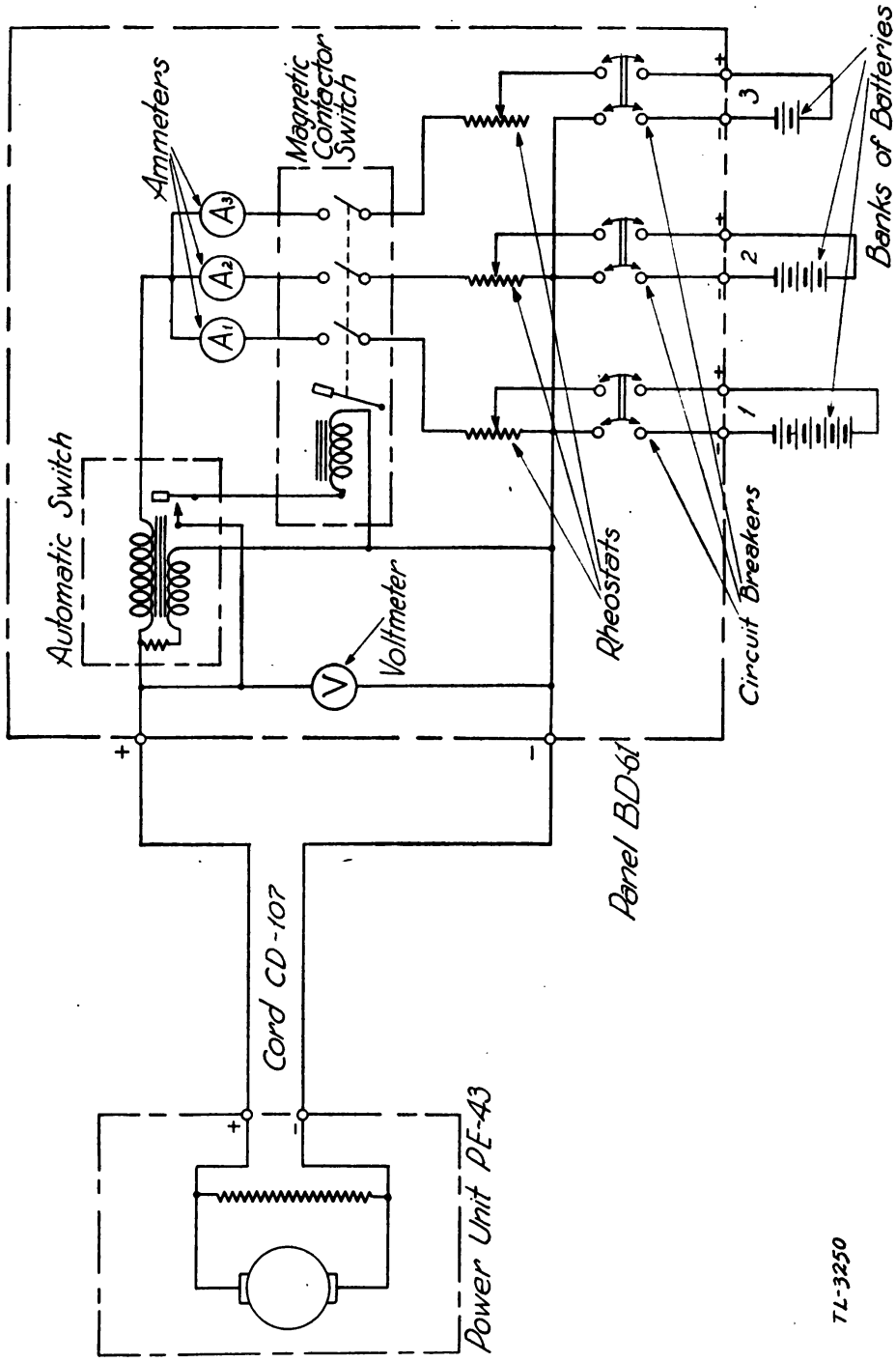

FIGURE 16.—Charging set SCR-169—circuit diagram with batteries.

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7. Function of parts.—*a. Power unit PE-( )-43.*—(1) *Power unit PE-HA-43.*—(*a*) *Speed regulation.*—The automatic electric voltage regulator operates to control the fuel feed so as to maintain an engine speed between 1,500 and 1,600 rpm (fig. 1).

(*b*) *Voltage regulation.*—The voltage regulator is designed to maintain the output voltage of the generator between 32 and 40 volts

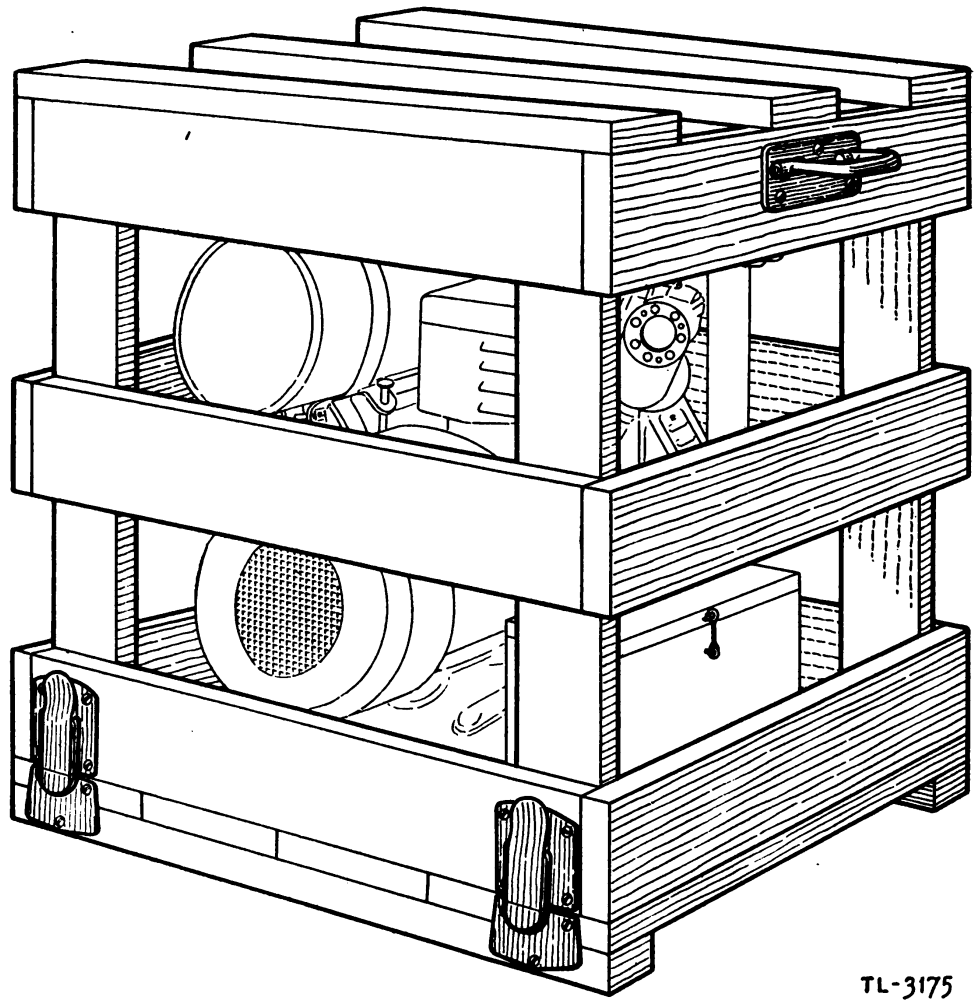

FIGURE 17.—Shipping crate for power unit PE-( )-43.

under load. It is adjusted at the factory to maintain 32 volts under full load when the armature is turning between 1,500 and 1,600 rpm. For further adjustment, if necessary, see paragraph 10*i*(1)(*a*) and *j*(1)(*a*).

(2) *Power unit PE-HB-43—voltage regulation.*—The voltage delivered by this power unit depends upon the speed. The speed is controlled by the governor spring tension. The adjustment for the

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governor is a knurled and slotted screw with a lock nut and is located below and to the left of the carburetor (fig. 2). To raise the voltage, loosen the lock nut and turn the adjusting screw clockwise. To lower the voltage, turn the adjusting screw counterclockwise. Do not set for more than 40 volts at normal load. Always be sure to tighten the lock nut when the desired voltage is obtained.

(3) *Power units PE-HC-43, PE-HD-43, and PE-HE-43 voltage regulation.*—The voltage delivered by these power units depends upon the speed of the engine, which is controlled by the governor spring tension. The governor has been tested and set for an operating speed of 2,350 rpm with the generator delivering full load. This adjustment should not be disturbed unless further adjustment is necessary. In this case turn the knurled nut on the governor adjusting screw clockwise to increase speed, or counterclockwise to reduce speed (fig. 5).

b. Panel BD-( )-61.—(1) *Panel BD-LL-61.*—(*a*) The function of the panel is to control and indicate the rate of charge to storage batteries; its circuit diagram is shown in figure 10. Provision is made for charging 1, 2, or 3 banks of batteries separately or simultaneously. An individual rheostat and an ammeter are provided for each of the three charging circuits.

(*b*) A magnetic contactor switch having three separately insulated and independent poles actuated by a single magnet is controlled by the automatic switch.

(*c*) The automatic switch controls the energizing circuit of the magnetic contactor switch in the following manner: The former closes the latter when the generator voltage reaches 40 volts; and opens it when the generator voltage falls below 32 volts, when the generator voltage fails, or when the current is reversed and flows from any one of the banks of batteries into the generator (fig. 16).

(2) *Panels BD-LM-61, BD-LN-61, BD-LO-61, and BD-LP-61.*—These panels perform the same functions as panel BD-LL-61 and are similar in design and appearance, except—

(*a*) Dimensions vary somewhat.

(*b*) Inclosed circuit-breakers are used instead of open switches and fuses.

(*c*) The magnetic contactor switch is inclosed.

A circuit diagram of these panels is shown in figure 11.

8. Care of set.—All parts of the set should be carefully handled. When installed, and at regular intervals thereafter, the set should be cleaned in order to keep it free from dirt and foreign substances. A daily inspection of all parts of the set should be made as a matter of routine in order to insure its best operating condition. This inspec-

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tion should include an examination for worn, broken, or corroded connections or parts; dirty panel; and grease and oil on engine or generator of the power unit.

9. Maintenance and repair of power unit PE-( )-43.—The inspection outlined in paragraph 4*c* and the correction of any defects noted are generally all the maintenance required. However, the following instructions on the servicing of the power unit should be carefully observed in the maintenance of the unit:

a. Engine.—(1) *PE-HA-43.*—(*a*) *Lubrication.*—Only the oils issued for the purpose should be used in lubricating the engine. One-

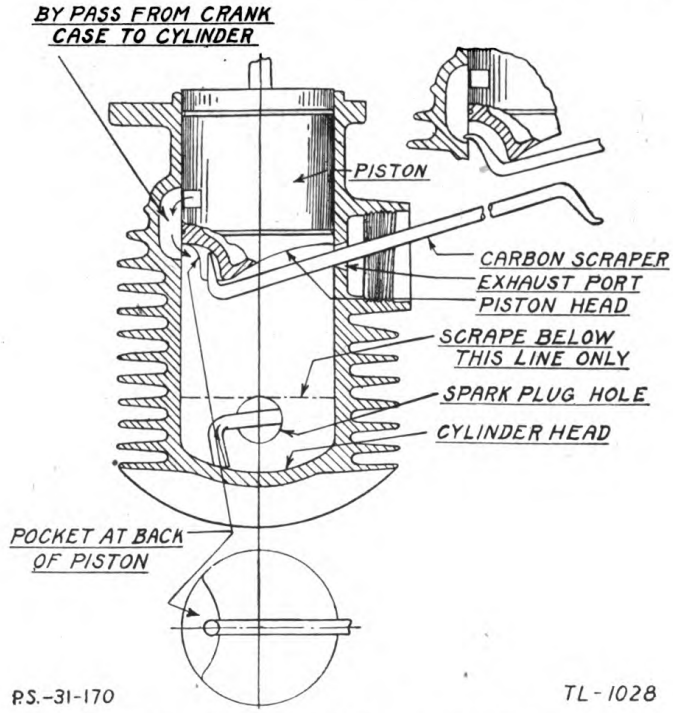

FIGURE 18.—Power unit PE-HA-43—use of carbon scraper.

half pint of good quality oil of viscosity SAE 40 should be mixed with each gallon of gasoline used as fuel. This provides automatic lubrication to all engine parts.

(*b*) *Removing carbon.*—To remove carbon from the engine remove the muffler and spark plug. Using the tool provided with the unit, carefully scrape the carbon deposits from the piston head, cylinder head, exhaust port, and spark-plug hole (fig. 18). The scraper should not come in contact with the cylinder wall. The cylinder should not be removed.

(*c*) *Care of magneto.*—Examine the contact breaker points at least

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once every 100 hours of operation, and clean and dress them if necessary. Use No. 00 grade sandpaper for dressing the points. Do not use emery cloth.

(*d*) *Carburetor adjustment.*—The carburetor is properly attached and adjusted to the engine before leaving the factory. Readjustment is necessary to compensate for climatic changes and for changes in the load. If, when attempting to start the engine for the first time, it does not run perfectly, first check the ignition. If the ignition circuits and adjustments are correct, proceed as follows:

1. *Starting.*—Push the choke plunger in as far as possible after inserting a few drops of gasoline into the choke body (fig. 1). Then turn the carburetor adjustment at the bottom of the carburetor in a clockwise direction until it is tight and then back in a counterclockwise direction one turn. If the engine still fails to start, vary the carburetor adjustment by quarter turns until a point is found where the engine will operate.

2. *Adjustment for operation.*—After the engine has been run under load for a sufficient length of time to have developed normal operating temperature, adjust the carburetor until the engine runs smoothly.

(2) *PE-HB-43.*—(*a*) *Lubrication.*—For proper lubrication, an adequate supply of a high grade, well-refined oil in the crankcase is essential. A viscosity of SAE 20 is suitable for average duty requirements, which consist of intermittent full loading or sustained partial loads. In hot weather, when heavy duty is required, that is, full loading for long periods of time, the use of oil of viscosity SAE 30 is advisable. Never use heavier than SAE 20 in cold weather.

1. Check the level of the oil in the crankcase every time the fuel supply is replenished. Add sufficient oil to bring the level of the oil to the top of the filler fitting.

2. After every 100 hours of operation the crankcase should be completely drained and refilled with fresh oil. (See (3)(*a*)*2* below.)

3. Whenever the drained oil shows signs of becoming thick or sticky, the crankcase should be removed and cleaned. (See (3)(*a*)*3* and *4* below.)

4. After every 50 hours of operation, the generator end bearing should be lubricated. A hole is provided for the purpose in the end of the starting pulley. Do not use excessive oil; a few drops are sufficient.

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(*b*) *Carburetor adjustment.*

1. The carburetor has only one adjustment, the needle valve for fuel regulation. Adjust for smooth operation when the engine is warmed up and under load. Avoid an overrich mixture.

2. The air cleaner is to protect the engine from dust and dirt and should be cleaned occasionally by removing and washing in kerosene. Test to see if it is clogged by blowing through it or by noting if engine performs better with it off. If clogged it should be replaced.

(*c*) *Governor adjustment.*—The governor is located on the side of the engine below and to the left of the carburetor. If necessary to adjust, see paragraph 7*a*(2).

(*d*) *Magneto.*—To get at the breaker points, remove the flywheel housing cover and then the flywheel cover which is held in place by three small screws. Turn the flywheel until the breaker points are exposed to view between the flywheel spokes.

1. If points are worn or pitted, they should be dressed with No. 00 or finer sandpaper until both faces are clean and smooth. This is done best by inserting a piece of sandpaper, folded double with sand sides out, between the points and dressing both points at the same time, while holding the points together. This insures the points coming together squarely. Wipe or blow out all particles of sand after dressing.

2. To adjust the breaker points, turn the flywheel until the cam on the crankshaft causes the breaker points to open to their fullest extent. Loosen the lock nut on the stationary point and insert a feeler gage or some other strip of metal 0.010 inch thick between the breaker points. Holding the points together with the feeler gage between them, tighten the adjusting screw which carries one point, and lock it in position with the lock nut. The maximum space between the points should equal the thickness of the feeler gage, or 0.010 inch. Check this space carefully. A slight further adjustment may be necessary.

(3) *PE–HC–43, PE–HD–43, PE–HE–43.*—(*a*) *Lubrication.*—The most important point in the care of the gasoline engine is an adequate

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supply of oil in the crankcase. A good quality oil with a viscosity of SAE 20 should be used for all year operation.

1. Check the oil in the base every time the fuel tank is filled. Add sufficient oil to bring the level of the oil to the top of the filler fitting.

2. After every 100 hours of operation the crankcase should be completely drained and refilled with fresh oil. Dilution of the oil by unburned fuel that may pass the piston rings and the gradual accumulation of dirt and small particles of metal in the crankcase make this a very necessary operation. The oil should be drained just after the engine has been run and while it is still hot. Always allow the crankcase to drain completely and do not use flushing solvents such as kerosene. Before refilling with the correct grade of fresh oil, make sure that the drain plug has been tightened securely.

3. Certain pockets in the crankcase will gradually accumulate a sediment that is the result of wear, carbon flaking, and dirt. In cold weather, water will collect in the crankcase when the moisture in the gasoline condenses as it passes the piston rings. This mixture of dirt, oil, water, and carbon, which is known as sludge, forms a gummy emulsion that will clog the oil strainer and pump valves and cause serious trouble if not removed in time. The condition of the drained oil should be carefully observed and whenever it shows signs of becoming sticky or thick, the crankcase should be thoroughly cleaned.

4. To clean the crankcase, remove the four screws that hold the crankcase to the base and clean out the sludge. Wash the oil pump at this time with a good grade of brush and naphtha. Do not use waste in cleaning the engine; if cloth must be used, it should be free of lint, as cheesecloth. If the gasket between the base and crankcase has been damaged in any way, replace it with a new gasket. Be sure to fill crankcase with clean oil to the top of the filler plug before starting engine.

(*b*) *Carburetor adjustment.*—The carburetor is an especially designed adjustable float-feed type. Adjustments should be made only when the engine is under load. Too rich a mixture should be avoided.

1. The sediment chamber should be cleaned whenever necessary. Close the shut-off valve in the line from the fuel

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tank and loosen the knurled thumbscrew at the bottom of the glass receptacle. When replacing the chamber, make sure that the rim of the glass is clean and firmly seated against the gasket. Replace gasket if it is damaged.

2. The air cleaner is to protect the engine from dust and dirt and should be cleaned occasionally by removing and washing in kerosene. Test to see if it is clogged by blowing through it or by noting if the engine performs better with it off. If clogged it should be replaced. Keep the oil level in air cleaner up to the beading on the body.

(*c*) *Governor adjustment.*—The governor has been adjusted for an operating speed of 2,350 rpm and should not be disturbed unless further adjustment is necessary. If necessary to adjust, refer to paragraph 7*a*(3).

(*d*) *Magneto.*—While the magneto plate is on the engine, turn the crankshaft by hand to see if contact points open and close properly. Points must be clean and line up squarely to make a good electrical contact. Do not use a file or emery cloth for dressing contact points. No. 00 grade sandpaper or finer should be used for best results.

b. Generator.—(1) *PE–HA–43.*—(*a*) *Lubrication.*—After every 50 hours of operation place a few drops of oil in the oilhole in the starting pulley. The generator ball bearings at the engine end of the shaft are automatically lubricated if fuel directions are followed.

(*b*) *Cleaning.*—Clean the carbon dust from the commutators and brush holders after every 100 hours of operation. If wiping with a coarse cloth does not clean the commutator sufficiently, rub lightly and sparingly with No. 00 or finer sandpaper while the unit is running.

(*c*) *Brushes.*—Replace immediately any broken or worn-out brushes. Keep an extra set of brushes available at all times. Replace brushes as follows: Remove the generator cover; loosen the nuts between the starting pulley and the housing; turn the bakelite insulating disk and the brush ring and remove the brushes; install new brushes; aline the white lines on the housing, the bakelite insulation disk, and the brush ring; tighten the nuts and replace the generator cover. Improper alinement of the white lines will cause excessive arcing and loss of power.

(*d*) *Voltage regulator.*—The voltage regulator is of commercial design. The adjustment screw is located on top of the regulator. Turning the screw in a clockwise direction increases the voltage. Turning the screw in a counterclockwise direction decreases the voltage. Tighten the lock nut after adjustment.

(2) *PE–HB–43.*—(*a*) *Lubrication.*—Too much oil in the generator bearing may cause trouble, as the excess oil may get on the commu-

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tator. The bearing has a reservoir and a substantial oil wick to carry oil to the shaft. A few drops of oil in the oil cup every 100 hours of operation will prove adequate.

(*b*) *Cleaning.*—Inspect commutator through inspection plate at bottom of end bell every 100 hours of operation. If dirty, wipe with coarse cloth; if this does not clean commutator sufficiently, rub lightly with No. 00 grade sandpaper or finer while unit is running.

(*c*) *Brushes.*- To remove brushes, remove slotted composition caps at sides of generator end bell and pull out brush. Brushes are marked R (right, facing generator) and L (left). Replace in same order and manner, letters up. Replace any broken or worn-out brushes. Keep an extra set of brushes available at all times.

(3) *PE-HC-43, PE-HD-43, PE-HE-43.*—(*a*) *Lubrication.*—Since there are no bearings in the generator, no lubrication is required.

(*b*) *Cleaning.*—Inspect commutator by removing the end cover which is fastened to the generator frame by three machine screws.

To clean the commutator, wipe with a coarse cloth; if this does not clean sufficiently, rub lightly with No. 00 or finer sandpaper while the unit is running.

(*c*) *Brushes.*— To remove brushes, remove lock wires holding brush and spring in brush holder. Remove the machine screw holding brush pigtail terminal to brush holder. Replace immediately any broken or worn-out brushes. Keep an extra set of brushes available at all times.

10. Troubles and their remedies.—Following are listed the most common troubles that may develop in the power unit PE-( )-43, and their remedies:

Trouble	*Remedy*
a. Engine difficult to start, or stops after starting.	
(1) Fuel supply exhausted.	(1) Fill tank with proper fuel mixture.
(2) Gasoline flow obstructed.	(2) Clean out fuel line.
(3) Cylinder flooded.	(3) Open choke, turn engine over a few times, and let stand a few minutes before starting.
(4) Improper gas mixture.	(4) Adjust carburetor. (*a*) PE-HA-43 (par. 9*a*(1)(*d*)). (*b*) PE-HB-43 (par. 9*a*(2)(*b*)). (*c*) PE-HC-43, PE-HD-43, PE-HE-43 (par. 9*a*(3)(*b*)).
(5) Defective magneto.	(5)
(*a*) Breaker points worn or pitted.	(*a*) Clean and smooth points (par. 9).

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Trouble	*Remedy*
(*b*) Breaker points out of adjustment.	(*b*) Adjust points to proper clearance (par. 9).
(*c*) Breaker cam out of time (PE–HB–43, PE–HC–43, PE–HD–43, PE–HE–43).	(*c*) Check flywheel shaft key.
(*d*) Switch wire loose or defective.	(*d*) Repair or replace switch wiring or insulation.
(*e*) High-voltage wire loose or defective (PE–HA–43).	(*e*) Repair or replace high-voltage wiring.
(6) Voltage regulator stuck (PE–HA–43).	(6) Tap outside of case lightly or remove plunger and clean.
	NOTE.—Care should be exercised to prevent damage of plunger or sleeve while cleaning or reassembling unit. The long holding screw through the shell assembly and shell end should extend into but not through the opening provided in plunger shell.
(7) Throttle valve stuck or out of adjustment (PE–HC–43, PE–HD–43, PE–HE–43).	(7) Clean and oil or readjust valve.
(8) Throttle rod loose (PE–HC–43, PE–HD–43, PE–HE–43).	(8) Tighten setscrew.
(9) Valve seats bad (PE–HC–43, PE–HD–43, PE–HE–43).	(9) Reseat valves (see TM 11–360).
(10) Valve sticking (PE–HC–43, PE–HD–43, PE–HE–43).	(10) Clean valves (see TM 11–360).
(11) Water in fuel supply.	(11) Drain carburetor (PE–HB–43, PE–HC–43, PE–HD–43, PE–HE–43), and refill with fuel from tank. If water is still present, drain tank and refill with fuel.
(12) Spark plug fouled or cracked.	(12) Clean or replace plug.
(13) Intake manifold leaking.	(13) Replace gasket or manifold if necessary.
(14) Improper timing.	(14) (*a*) *PE–HB–43.*—When the piston comes up on exhaust stroke

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Trouble	*Remedy*
	the exhaust valve should be closed when the piston reaches top dead center. The next stroke is the intake stroke, and the intake valve should start to open after the crank has traveled from 4° to 5° past dead center, or the piston has traveled down from top dead center a distance of from 0.009 to 0.010 inch. (*b*) *PE–HC–43, PE–HD–43, PE–HE–43.*—To check valve clearance, remove valve cover plate. The correct clearance of the exhaust valve is 0.008 inch and the intake valve 0.006 inch when the engine is cold. Tappet clearance is adjusted by grinding the required amount from the end of the valve stem. End of the stem must be square with stem proper. The valves are timed by the meshing of the camshaft gear with the gear on the crankshaft. These gears are properly meshed when the mark on the camshaft gear is in line with the mark on the crankshaft collar. To reseat valves grind in the same manner as automobile valves.
(15) Loose or defective wiring.	(15) Tighten, repair, or replace wiring.
b. Engine misses or stops suddenly.	
(1) Fuel supply exhausted or fuel line clogged.	(1) Fill tank or blow out fuel line.
(2) Loose, broken, or fouled spark plug.	(2) Tighten, clean, or replace plug.
(3) Fouled magneto points.	(3) Clean or replace points (par. 9).
(4) Defective wiring.	(4) Replace wiring.
(5) Valves warped or sticking (PE–HB–43, PE–HC–43, PE–HD–43, PE–HE–43).	(5) Clean or replace valves (see TM 11–360).

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Trouble	*Remedy*
(6) Valve tappets sticking or out of adjustment (PE–HB–43, PE–HC–43, PE–HD–43, PE–HE–43).	(6) See (8) below and TM 11–360.
(7) Carburetor out of adjustment.	(7) Adjust carburetor (*a*(4) above).
(8) Cylinder head gasket leaking (PE–HB–43, PE–HC–43, PE–HD–43, PE–HE–43).	(8) Replace gasket.
(9) Manifold gasket leaking.	(9) Replace gasket.
c. Engine overheating.	
(1) Poor grade of oil or insufficient oil.	(1) Use only specified oil in specified quantity (par. 5).
(2) Excessive carbon deposit.	(2) Remove carbon.
(3) Magneto points out of adjustment.	(3) Adjust points (par. 9).
(4) Carburetor out of adjustment.	(4) Adjust carburetor (par. 9).
(5) Choke partly closed.	(5) Open choke.
(6) Piston rings sticking.	(6) Use proper grade of oil. If still sticking, replace rings.
(7) Improper timing (PE–HC–43, PE–HD–43, PE–HE–43).	(7) Correct timing (*a*(14) above).
(8) Muffler clogged.	(8) Clean or replace muffler.
(9) Governor or thistle loose.	(9) Tighten setscrews and lock nuts.
(10) Air cleaner clogged.	(10) Remove and wash in kerosene.
(11) Excessive oil in fuel (PE–HA–43).	(11) Use only specified amount of oil (par. 5*a*(1)(*a*)).
d. Engine knocks.	
(1) Improper fuel mixture.	(1) Allow engine to reach normal operating temperature under load, open choke, and adjust carburetor (par. 9).
(2) Heavy carbon deposit in cylinder.	(2) Remove carbon. (*a*) *PE–HA–43.*—See paragraph 9*a*(1)(*b*). (*b*) *PE–HC–43, PE–HD–43, PE–HE–43.*—Remove cylinder head and remove carbon.

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Trouble	*Remedy*
(3) Overheated engine.	(3) See *c* above.
(4) Magneto points set too far apart.	(4) Set points to proper clearance (par. 9).
(5) Loose main bearings or connecting rod bearings.	(5) Replace loose bearings.
(6) Loose flywheel.	(6) Replace key and tighten flywheel.
(7) Lack of oil (PE-HB-43, PE-HC-43, PE-HD-43, PE-HE-43).	(7) Add sufficient amount of proper grade of oil to bring level up to top of filler fitting (par. 5).
(8) Loose valve tappets (PE-HB-43, PE-HC-43, PE-HD-43, PE-HE-43).	(8) Set tappets to proper clearance. (*a*) *Exhaust.*—.008 inch with engine cold. (*b*) *Intake.*—.006 inch with engine cold. Clearance is adjusted by grinding the required amount off the end of the valve stem, keeping end square with stem proper.
e. Engine lacks power.	
(1) Engine overheated due to excessive carbon.	(1) Remove carbon (*d*(2) above).
(2) Carburetor out of adjustment.	(2) Adjust carburetor (par. 9).
(3) Magneto points too close.	(3) Adjust points (par. 9).
(4) Poor compression.	(4)
(*a*) Valves not seating (PE-HB-43, PE-HC-43, PE-HD-43, PE-HE-43).	(*a*) Grind valves in same manner as automobile valves.
(*b*) Valves sticking (PE-HB-43, PE-HC-43, PE-HD-43, PE-HE-43).	(*b*) See TM 11-360.
(*c*) Valves tappets sticking (PE-HB-43, PE-HC-43, PE-HD-43, PE-HE-43).	(*c*) Clean in same manner as (*b*) above.
(*d*) Valve tappets set too close (PE-HB-43, PE-HC-43, PE-HD-43, PE-HE-43).	(*d*) Set to proper clearance (*d*(8) above).
(*e*) Piston ring defective.	(*e*) Replace piston ring.
(*f*) Loose, fouled, or cracked spark plug.	(*f*) Tighten, clean, or replace plug.

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Trouble	*Remedy*
(5) Poor fuel.	(5) Replace with suitable fuel.
(6) Voltage regulator inoperative (PE–HA–43).	(6) Check leads that connect regulator to the output of the generator, If the regulator becomes unserviceable, remove it and its leads, plug the hole in the top of the carburetor with a cork, and continue to use. the set.
(7) Muffler clogged by carbon.	(7) Clean muffler.
(8) Governor loose.	(8) Tighten governor lock nut or setscrew (PE–HB–43, PE–HC–43, PE–HD–43, PE–HE–43).
(9) Improper timing.	(9) Correct timing (*a* (14) above).
(10) Oil badly diluted (PE–HB–43, PE–HC–43, PE–HD–43, PE–HE–43).	(10) Change oil.
(11) Air cleaner clogged.	(11) Remove and wash in kerosene. If still clogged, replace.
f. Explosion in carburetor or in intake manifold.	
(1) Fuel mixture too lean.	(1) Open needle valve slightly.
(2) Intake valve sticking, warped, or broken (PE–HB–43, (PE–HC–43, PE–HD–43, PE–HE–43).	(2) Clean or replace valve.
(3) Intake valve spring weak.	(3) Replace valve spring.
(4) Intake tappets set too close (PE–HB–43, PE–HC–43, PE–HD–43, PE–HE–43).	(4) See *d*(8) above.
(5) Intake manifold leaking.	(5) Replace gasket or manifold.
(6) Cylinder head gasket leaking.	(6) Replace gasket.
g. Excessive smoke from exhaust.	
(1) Too much oil.	(1)
(*a*) In fuel (PE–HA–43).	(*a*) Use only specified quantity of proper grade of oil.
(*b*) In crankcase (PE–HB–43, PE–HC–43, PE–HD–43, PE–HE–43).	(*b*) Use specified quantity of proper grade of oil.
(2) Carburetor needle valve open too far.	(2) Partly closed needle valve.

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Trouble	*Remedy*
(3) Carburetor float sticking or leaking (PE-HB-43, PE-HC-43, PE-HD-43, PE-HE-43).	(3) Clean or replace float.
(4) Worn piston or rings.	(4) Replace piston or rings.
h. Generator gives no voltage.	
(1) Open windings.	(1) Do not attempt to make repairs in the using organization.
(2) Broken brush leads or poor brush contact.	(2) Examine and repair or replace broken connections, or replace brushes as indicated in paragraph 9*b*(1)(*c*), (2)(*c*), or (3)(*c*).
i. Generator voltage too high.	
Engine speed too fast.	Decrease engine speed.
(1) PE-HA-43.	(1) Turn adjusting screw on top of the voltage regulator in a counterclockwise direction until the proper voltage is obtained under load.
(2) PE-HB-43.	(2) See paragraph 9*a*(2)(*c*).
(3) PE-HC-43, PE-HD-43, PE-PE-HE-43.	(3) See paragraph 9*a*(3)(*c*).
j. Generator voltage too low.	
(1) Engine speed too slow.	(1) Increase engine speed.
(*a*) PE-HA-43.	(*a*) Turn adjusting screw on top of voltage regulator in a clockwise direction until proper voltage is obtained under load.
(*b*) PE-HB-43.	(*b*) See paragraph 9*a*(2)(*c*).
(*c*) PE-HC-43, PE-HD-43, PE-HE-43.	(*c*) See paragraph 9*a*(3)(*c*).
(2) Poor brush contact.	(2) Replace brushes.
(*a*) PE-HA-43.	(*a*) See paragraph 9*b*(1)(*c*).
(*b*) PE-HB-43.	(*b*) See paragraph 9*b*(2)(*c*).
(*c*) PE-HC-43, PE-HD-43, PE-HE-43.	(*c*) See paragraph 9*b*(3)(*c*).

11. List of replacement parts.—A list of replacement parts of power unit PE-( )-43 and panel BD-( )-61 is given below (*a* to *au*, incl.). Some parts of power units PE-HD-43 and PE-HE-43 are not included in this list since complete data are not available.

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A	B	C	D	E	F	G
Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43	PE-HE-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
a	Connecting rod and piston assembly		RA-2005			
	Includes items		1 to 12			
b	Connecting rod assembly	11034	RA-1025	99790	99790	99790.
	Includes items	7	7 to 12	8 to 10	8 to 12	8 to 12.
c	Piston assembly, standard			29386	99920	99920.
	Includes items			1 to 4; 6	1 to 4; 6	1 to 4; 6.
1	Piston, standard	11569	RA-5	69917	99963	99963.
2	Ring, piston compression, standard	10534	RA-14	65451	21203	21203.
3	Ring, piston center, standard		RA-111	65451	21202	21202.
4	Ring, piston oil retaining, standard		RA-484	61505	61505	61505.
5	Pin, piston, standard	10546	RA-27	65863	65863	65863.
6	Ring, piston pin retaining	10547	RA-23	66246	66246	66246.
7	Bushing, piston pin	10542	RA-48			
8	Screw, connecting rod		RA-89	63689	92146	92146.
9	Nut, connecting rod screw		5-M	91643		
10	Cotter pin, connecting rod screw		4-P-06	92288		
11	Rod, connecting		RA-25-A			
12	Washer, connecting rod screw		RA-94		22082	22082.
13	Crank-pin bearing assembly	11710				
14	Screw, crank pin	11078				
15	Lock washer, crank pin screw	10525				
16	Washer, crank pin outer	11252				
17	Washer, crank pin inner	11079				
d	Piston assembly, 0.010 inch oversize [1]			99967	99967	99967.
	Includes items			18 to 21	18 to 21	18 to 21.
e	Piston assembly, 0.020 inch oversize [1]			99968	99968	99968.
	Includes items			22 to 25	22 to 25	22 to 25.
f	Piston assembly, 0.030 inch oversize [1]			99969	99969	99969.
	Includes items			26 to 29	26 to 29	26 to 29.
18	Piston, 0.010 inch oversize [1]			99964	99964	99964.

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19	Ring, piston compression, 0.010 inch oversize [1]			61010	21219	21219.
20	Ring, piston center, 0.010 inch oversize [1]			61010	21222	21222.
21	Ring, piston oil retainer, 0.010 inch oversize [1]			61747	61747	61747.
22	Piston, 0.020 inch oversize [1]			99965	99965	99965.
23	Ring, piston compression, 0.020 inch oversize [1]			61012	21220	21220.
24	Ring, piston center, 0.020 inch oversize [1]			61012	21223	21223.
25	Ring, piston oil retainer, 0.020 inch oversize [1]			61748	61748	61748.
26	Piston, 0.030 inch oversize [1]			99966	99966	99966.
27	Ring, piston compression, 0.030 inch oversize [1]			61013	21221	21221.
28	Ring, piston center, 0.030 inch oversize [1]			61013	21224	21224.
29	Ring, piston oil retainer, 0.030 inch oversize [1]			61749	61749	61749.
30	Pin, piston, 0.005 inch oversize [1]			63436	63436	63436.
g	Crankshaft assembly		RA-1024-5			
	Includes items		31 to 35			
31	Crankshaft		RA-24-T	26291	26377	26377.
32	Gear, timing on crankshaft		RA-12			
33	Collar, spacing on crankshaft		RA-40			
34	Pin, timing gear		RA-103			
35	Cone, bearing, on crankshaft		RA-428			
36	Key, flywheel			66403	66403	66403.
37	Key, generator coupling			63159		
38	Nut, crank throw	10526				
39	Lock washer, crank throw nut	10525				
h	Oil pump assembly		RA-1193	29569	29569	29569.
	Includes items		40 to 52	43 to 46	43 to 46	43 to 46.
i	Piston assembly, oil pump		RA-1366			
	Includes items		40 to 42			
40	Piston, oil pump		RA-366	63207	63207	63207.
41	Ball, oil pump check, ¼ inch		8-AE			
42	Pin, oil pump ball stop		RA-367-A			
43	Plunger, oil pump		RA-364-B	29340	29340	29340.
44	Body, oil pump			29338	29338	29338.
45	Spring, oil pump, large		RA-375-B			
46	Spring, oil pump, small		RA-377	26413	26413	26413.
47	Retainer, oil pump check ball		RA-368-A			
48	Guide, oil pump plunger		RA-426			
49	Body, oil strainer		RA-477			
50	Screen, oil strainer		RA-478	69120	69120	69120.

[1] Denotes an oversize repair item which is not required except when replacing to compensate for wear in other parts.

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A	B	C	D	E	F	G
Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43	PE-HE-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
51	Retainer, oil strainer screen		RA-480	62082	62082	62082.
52	Ball, oil pump check, 5/16 inch		10-AE			
53	Screw, oil pump		5-C-06			
54	Lock washer, oil pump screw		5-W			
55	Retainer, oil pump tube			62081	62081	62081.
56	Rod, oil pump			29011	29011	29011.
57	Tube, oil pump			29065	29065	29065.
58	Connector, oil pump tube			63202	63202	63202.
j	Cylinder assembly		RA-500103	99216	89423	89423.
	Includes items		59 to 78	92, 93; *l*	92, 93; *l*	92, 93; *l*.
59	Cylinder	11399	RA-1-F			
60	Valve, intake		RA-20-A	68923	68923	68923.
61	Valve, exhaust		RA-20-A	68273	23354	23354.
62	Cup, valve spring		RA-72	62233	62233	62233.
63	Spring, valve	15080	RA-57-A	65906	65906	65906.
64	Cap, valve spring retainer		RA-50	68293	68293	68293.
65	Key, valve spring retainer		RA-258-A	68283	68283	68283.
66	Guide, valve		RA-197-A			
67	Tappets, valve (lifter)		RA-65-A	62377	63277	63277.
68	Gear, cam		RA-26-A	61167	61167	61167.
69	Cover, valve springs		RA-19-A	62154	62154	62154.
70	Gasket, valve spring cover		RA-217-A	65617	65617	65617.
71	Screw, valve cover plate		5-C-05	91389	91389	91389.
72	Washer, valve cover plate		5-W	22353	22353	22353.
73	Plug, camshaft			68122	68122	68122.
74	Shaft, cam gear			68333	68333	68333.
75	Nut, cam gear stud		9-K			
76	Stud, main bearing housing		RA-61			
77	Lock washer, cam gear stud		9-W			
78	Stud, cylinder head		RA-68-A			
79	Shield, cylinder	10555		62335	22142	22142.

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k	Louvre plate assembly		RA-1235-2			
	Includes items		80, 81			
80	Louvre plate		RA-235-F			
81	Tapping plate		RA-499			
82	Top sheet		RA-236-J			
83	Side sheet exhaust side		RA-237-E			
84	Side sheet, carburetor side		RA-238-C			
85	Bearing, crankshaft, ball			99157	99157	99157.
86	Oil seal, crankshaft bearing			99175	99175	99175.
87	Screw, cylinder shield	10497		90916	90916	90916.
88	Lock washer, cylinder shield screw	10485		90832	90832	90832.
89	Screw, top sheet, round head machine		¼-20 × 3/8"			
90	Lock washer, top sheet screw		4-W			
91	Screw, fillister head, top sheet to cylinder head (plated)		5-G-010			
92	Bushing, governor crank			63492	63492	63492.
93	Valve, oil			89307	89307	89307.
l	Breather assembly		RA-1393-1	69751	69751	69751.
	Includes items		92 to 97			
94	Washer, breather check		RA-380			
95	Disk, breather check		RA-381-A			
96	Spacer, breather screen		RA-382			
97	Body, breather		RA-393-B			
98	Screen, breather		RA-396-A			
99	Gasket, breather body		RA-397-A			
100	Screw, fillister head, machine, breather		4-G-112			
101	Washer, fiber, breather body screws		RL-225			
102	Moss		Dixie			
103	Head, cylinder		RA-4-B	21240	21240	21240.
104	Gasket, cylinder head		RA-114-A	69004	69004	69004.
105	Gasket, cyllnder	10551				
106	Plug, spark, 18 mm x 1.5 mm thread	3H4413-7	RA-359	89572	89572	89572.
107	Screw, cylinder	10494				
108	Screw, cylinder head, short			91162	91162	91162.
109	Screw, cylinder head, medium			91386	91386	91386.
110	Screw, cylinder head, long			91387	91387	91387.
111	Washer, cylinder head stud		RA-261			
112	Spacer, cylinder head, long			63336	63336	63336.
113	Spacer, cylinder head, medium			63337	63337	63337.
114	Spacer, cylinder head, washer			91324	91324	91324.

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A	B	C	D	E	F	G
Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43	PE-HE-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
115	Shield, spark plug			29131	29131	29131.
116	Spring, spark plug shield			46133	46133	46133.
117	Nut, cylinder to base stud		5-K			
118	Lock washer, base stud nut		5-W			
119	Choke rod assembly			99824	89431	89431.
m	Governor assembly		RA-1010			
	Includes items		131 to 135			
n	Governor housing assembly		RA-1053-2			
	Includes items		120 to 130			
o	Governor fork and lever shaft assembly		RA-1054-2			
	Includes items		124 to 130			
p	Governor sleeve assembly		RA-1472			
	Includes items		136, 137			
120	Screw, speed regulator		RA-44-B			
121	Housing, governor fork		RA-53-B			
122	Spring, governor lever return		RA-58			
123	Rod, throttle		RA-490			
124	Shaft, governor fork		RA-52			
125	Fork, governor		RA-54-B			
126	Lever, governor		RA-55			
127	Spring, governor		RA-183			
128	Screw, countersunk head		8-32-AK-04			
129	Pin, escutcheon		14-AN-04			
130	Nut, check (plated)		7/16" SAE			
131	Ball, governor		RA-10-C			
132	Head, governor		RA-56			
133	Stud, governor sleeve		RA-473			
134	Pin, governor ball		RA-7-A			
135	Stud, cam gear		RA-28-A			
136	Sleeve, governor		RA-472-C			
137	Bearing, ball		RA-481			

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138	Gasket, governor housing		RA-294			
139	Screw, governor control		5-G-05			
140	Lock washer, governor control screw		5-W			
141	Shaft, governor			63493	63493	63439.
142	Bushing, governor crank			63492	63492	63492.
143	Crank, governor			68643	68643	68643.
144	Gear, governor			90543	29374	29374.
145	Pin, cotter			92288	92288	92288.
146	Screw, governor lever clamp			90202	90202	90202.
147	Spring, throttle			65126	67956	67956.
148	Link, throttle			65086	26275	26275.
149	Screw, governor gear			90891	90891	90891.
150	Lock washer, governor gear screw			90832	90832	90832.
151	Washer, governor gear screw			92305	92305	92305.
152	Strap, governor control			22158	22158	22158.
153	Control, governor			89014	89014	89014.
154	Bell crank assembly			29208	29208	29208.
155	Screw, bell crank			91253	91253	91253.
156	Bushing, bell crank			63067	63067	63067.
157	Washer, bell crank			62199	62199	62199.
158	Screw, bell crank			90891	90891	90891.
159	Clip, throttle spring			67992		
160	Screw, throttle spring clip			91196		
q	Carburetor assembly	15215	RAY-202-B	99831	89430	89430.
	Includes items	161 to 165		161 to 187	161 to 275	161 to 275.
r	Carburetor cover assembly			29632		
	Includes items			183 to 187		
s	Choke wire assembly		RA-1350			
	Includes items		263 to 267			
t	Fuel filter assembly	15251		99910	99910	99910.
	Includes items			268 to 275	268 to 275	268 to 275.
u	Air cleaner assembly			29447	99908	99908.
	Includes items			281 to 287	281 to 284; 286	281 to 284; 286.
v	Carburetor upper body assembly				99772	99772.
	Includes items				248 to 262	248 to 262.
161	Gasket, carburetor	11219	RA-295	65667	68857	68857.
162	Nozzle, carburetor	15029	05479		23351	23351.
163	Valve, needle	11417	03941	69460	99621	99621.
164	Nut, carburetor stuffing box	15033				
165	Screen, carburetor	15218	0802			

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Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43	PE-HE-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
166	Bowl, carburetor			99573	21395	21395.
167	Float, carburetor		01459	69149	99622	99622.
168	Hinge, pin, carburetor float				23114	23114.
169	Screw, carburetor cover		054	90781		
170	Lock washer, carburetor cover screw		0992	90367		
171	Barrel, carburetor			69296		
172	Horn air			99825		
173	Screw, carburetor barrel			91282		
174	Lock washer, carburetor barrel screw			92290		
175	Screw, carburetor air bleed		052	63157		
176	Screw, carburetor body			91284	90200	90200.
177	Lock washer, carburetor mounting screw				91199	91199.
178	Plug, carburetor drain	15238		63165		
179	Screw, 9/32 x 1/2" fillister head			90558		
180	Screw, idle adjusting		03257	23164		
181	Spring, idle adjusting		0788	26185		
182	Screw, air horn			90202		
183	Cover and seat, carburetor	18020		29915		
184	Elbow, inlet connection			63745		
185	Washer, fiber inlet, lower			65724		
186	Washer, fiber inlet, upper			65734		
187	Nut, carburetor cover			91692		
188	Lock washer	4351				
w	Float bowl cover assembly		04971			
	Includes items		189 to 200			
189	Pin, float lever pinion		03369			
190	Cover, float bowl		01794			
191	Screw, float bowl cover vent		01434			
192	Lock washer, float bowl cover vent screw		0759			
193	Gasket, float bowl cover		01845			
194	Screw, float plug		02744			

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195	Connector, inlet		03453				
196	Screw, inlet connector		02409				
197	Gasket, inlet connector screw		02410				
198	Gasket, inlet seat		0337				
199	Inlet needle and seat assembly		04050				
200	Seat, inlet valve		04043				
201	Venturi				21216		21216.
202	Gasket, venturi				68897		68897.
203	Packing, needle valve				68887		68887.
204	Washer, needle valve packing				22032		22032.
205	Nut, needle valve packing				23227		23227.
206	Choke valve, carburetor				22050		22050.
207	Screw, choke valve (#8 x ¼" round head)				90029		90029.
208	Lock washer, choke valve (No. 4)				90369		90369.
209	Screw, swivel				92017		92017.
210	Valve and seat, inlet				99636		99636.
211	Gasket, inlet valve seat				68877		68877.
x	Choke shaft and lever assembly		04865		89428		89428.
	Includes items		212 to 226				
212	Choke lever assembly		04911				
213	Shaft, choke		04912				
214	Shutter, choke		04963				
215	Screw, choke shutter retaining		0120				
216	Lever, choke stop		04106				
217	Pin, choke stop lever retaining		03208				
218	Choke lever and swivel assembly		05994				
219	Choke lever		01830				
220	Pin, choke lever retaining						
221	Screw, choke lever clamp		0240				
222	Peg, choke lever stop		05006				
223	Swivel, choke lever		05680				
224	Washer, choke lever swivel		04920				
225	Screw, choke lever swivel		058				
226	Spring, choke lever return		04122				
y	Throttle and lever assembly		04864				
	Includes items		227 to 248				
227	Shaft, throttle		05553				
228	Shutter, throttle		04119				
229	Screw, throttle shutter retaining		0120				
230	Throttle lever and swivel assembly		05992				

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Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43	PE-HE-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
231	Screw, throttle lever retaining		051			
232	Swivel, throttle lever		05680			
233	Washer, throttle lever swivel		04920			
234	Lever, throttle shaft		04107			
235	Peg, throttle lever stop		03517			
236	Tip, nozzle		04118			
237	Nozzle, shank		04202			
238	Gasket, main nozzle		02817			
239	Gland, main adjustment screw		0702			
240	Packing, main adjustment screw gland		0705			
241	Nut, main adjustment screw packing		0703			
242	Gasket, main adjustment screw gland		0676			
243	Screw, main adjustment		03076			
244	Cross bar		0700			
245	Stem		0701			
246	Needle		03075			
247	Plug, body		03575			
248	Body		05541			
249	Bushing, throttle shaft				23230	23230.
250	Upper body, carburetor				99954	99954.
251	Spring, idler valve				26157	26157.
252	Valve, idler needle				23228	23228.
253	Valve, carburetor throttle				22036	22036.
254	Screw, throttle valve (4-32 x ½" round head)				90029	90029.
255	Lock washer, throttle valve screw (No. 4)				90369	90369.
256	Stop, throttle				61967	61967.
257	Throttle shaft assembly				99635	99635.
258	Lever, throttle				21152	21152.
259	Pin, throttle stop and lever				23125	23125.
260	Spring, throttle stop				26119	26119.
261	Screw, throttle stop spring				91920	91920.

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262	Elbow, rburetor connector		A-351		63377		63377.
263	Wire, c hoke						
264	Conduit, choke		A-350				
265	Clip, choke wire conduit		A-347				
266	Clip, loop		A-348				
267	Button, choke		A-349				
268	Bowl, fuel filter			68487	68487		68487.
269	Yoke, fuel filter			99665	99665		99665.
270	Screen, filter			62876	62876		62876.
271	Gasket, filter			68477	68477		68477.
z	Fuel filter cover assembly			99909	99909		99909.
	Includes items			272 to 275	272 to 275		272 to 275.
272	Nipple, fuel tank			91635	91635		91635.
273	Connector, filter			53029	53029		53029.
274	Lever, shut-off		RA-307	23347	23347		23347.
275	Nut, shut-off lever retaining			23346	23346		23346.
276	Packing, shut-off lever			27019	27019		27019.
277	Elbow, carburetor intake				21195		21195.
278	Gasket, intake elbow				68987		68987.
278A	Lock nut, intake elbow				23345		23345.
278B	Screw, intake elbow mounting				91422		91422.
278C	Lock washer, intake elbow mounting screw				90832		90832.
278D	Line, fuel				89227		89227.
279	Screw, choke retainer	H-50					
280	Lock washer, choke retainer screw	H-351					
281	Bowl, air cleaner			29681	99926		99926.
282	Filter, air cleaner			29680			
283	Gasket, air cleaner cover			67897			
284	Cover, air cleaner			29679	99925		99925.
285	Stem, air cleaner			63733	23343		23343.
286	Wing nut, air cleaner			91674	91674		91674.
287	Gasket, air cleaner			67247	27016		27016.
288	Air cleaner, Donaldson		RA-413				
289	Elbow, air cleaner		RA-383-A				
290	Screw, $\frac{9}{32}$ x $1\frac{1}{4}$"		8-32V18				
291	Pipe, air cleaner			61664	21196		21196.
292	Screw, air cleaner pipe			91256			
293	Strap, air cleaner mounting, upper			62446			
294	Strap, air cleaner mounting, lower			62447			
295	Screw, air cleaner mounting			90950			

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Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43	PE-HE-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
296	Nut, air cleaner mounting screw			91208		
297	Lock washer, air cleaner mounting screw			90366		
298	Spacer, air cleaner pipe			63848		
299	Stud, air cleaner pipe			63849		
300	Nut, air cleaner pipe stud			91744		
301	Pipe, intake		RA-319-D			
302	Gasket, intake pipe		RA-293			
303	Gasket, carburetor to intake pipe		RA-295			
304	Screw, intake pipe		4-C-05			
305	Lock washer, intake pipe screw		4-W			
306	Nut, intake pipe	10567				
307	Spring, intake pipe nut retaining	15219				
308	Screw, carburetor mounting			91691		
309	Lock washer, carburetor mounting screw			90832		
310	Brace, air cleaner elbow				22135	22135.
311	Screw, elbow mounting brace				90891	90891.
312	Lock washer, elbow brace mounting screw				90832	90832.
313	Lock nut, elbow mounting brace				92129	92129.
314	Lock washer, elbow brace lock nut				90832	90832.
315	Screw, elbow mounting				92134	92134.
316	Lock washer, elbow mounting screw				90832	90832.
317	Washer, elbow mounting screw				22144	22144.
318	Lock nut, elbow mounting screw				92129	92129.
aa	Magneto assembly	15005	23125	29120	89426	89426.
	Includes items		319 to 357			
ab	Magneto stator assembly		23128			
	Includes items		319 to 321			
ac	Magneto winding assembly					
	Includes items		322 to 327			
ad	Magneto capacitor assembly					
	Includes items		328 to 334			

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ae	Magneto breaker assembly		335 to 357			
	Includes items					69780.
af	Contact block assembly			69780	69780	
	Includes items			357 to 362	357 to 362	357 to 362.
ag	Spark plug wire assembly		RA-1207-1			
	Includes items		368, 369			
319	Casting, stator		23129			
320	Grommet, rubber, high-tension cable		17466			
321	Grommet, rubber, ground cable		20482			
322	Winding, magneto		21808			
323	Screw, winding core		20791			
324	Lock washer, winding core screw		20817			
325	Cable, high-tension with terminal		21313	99902	99902	99902.
326	Cable, ground with solder clip		21978			
327	Clip, solder, ground cable		20490			
328	Capacitor		20549	29652	29652	29652.
329	Screw, capacitor mounting		17183	92308	92308	29308.
330	Lock washer, capacitor mounting screw		15126	92290	92290	92290.
331	Strap, connecting		20127			
332	Nut, capacitor binding post		9407			
333	Lock washer, capacitor binding post		21031			
334	Screw, fastening, for capacitor	15137				
335	Point, screw contact		22887	63238	63238	63238.
336	Lock nut, contact point screw		22944	63239	63239	63229.
337	Lock washer, contact point screw		22615	91122	91122	91122.
338	Plate, adjustable breaker		23019			
339	Screw, breaker plate		17393			
340	Contact, breaker	15308				
341	Contact point, breaker, long point	337				
342	Contact point, breaker, short point	336				
343	Magneto (United American Bosch) (replacing 15005)	MCJ1B				
344	Wrench and gage	15081				
345	Capacitor, magneto (Robt. Bosch Magneto Co.)	2KO-24				
346	Washer, breaker plate screw		15024			
347	Lock washer, breaker plate screw		20975			
348	Washer, insulating, contact screw		22985			
349	Washer, insulating, contact screw		22986			
350	Lever, breaker, with contact point		22671			
351	Spring, breaker lever		22066			
352	Clip, breaker lever spring		20476			

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Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43	PE-HE-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
353	Washer, breaker lever spacing (0.050" thick)		20481			
354	Washer, breaker lever spacing (0.016" thick)		20547			
355	Washer, breaker lever spacing (0.006" thick)		20485			
356	Wick, breaker lever bearing oil		20484			
357	Plate, breaker, with contact screw		23018			
358	Screw, contact block			63369	63369	63369.
359	Lock washer, contact block screw			90367	90367	90367.
360	Stop, contact spring			62100	62100	62100.
361	Point and spring, contact			69754	69754	69754.
362	Block, contact spring			65078	65078	65078.
363	Nut, contact block			90313	90313	90313.
364	Bearing, magneto, with oil retaining ring			69911	69111	69911.
365	Ring, oil retaining			62235	62235	62235.
366	Screw, magneto mounting	11674		91385	91385	19385.
367	Lock washer, magneto mounting screw	H-169		91388	91388	91388.
368	Terminal, ignition cable		RA-518-A			
369	Cable, ignition	15310	RA-207-A	See 369A	See 369A	See 369A.
369A	Cable, ignition (not included in assembly *aa*)			29147	29147	29147.
370	Brusk holder, magneto	15309				
371	Gasket, magneto bracket	10590				
372	Gasket, magneto plate (0.005" thick)			66527	66527	66527.
373	Gasket, magneto plate (0.009" thick) [1]			66537	66537	66537.
374	Gasket, magneto plate (0.015" thick) [1]			66457	66457	66457.
375	Plate, magneto			69876	89085	89085.
376	Armature, magneto			29656	29656	29656.
377	Plate, contact block connector			62178	62178	62178.
378	Insulator, armature lead			65725	65725	65725.
379	Insulator, capacitor lead			65735	65735	65735.
380	Screw, armature mounting			91270	91270	91270.
381	Lock washer, armature mounting screw			90832	90832	90832.
382	Clip, dust cover			68876	68876	68876.

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383	Dust cover, magneto point			65198	65198		65198.
384	Plunger, magneto			65414	65414		65414.
385	Air guide, magneto plate			29107	22309		22309.
386	Valve, oil return			89307	89307		89307.
ah	Fuel tank assembly		RA-2429-1				
	Includes items		387 to 401				
ai	Bare fuel tank assembly		RA-1429-1				
	Includes items		387 to 391				
aj	Filler cap assembly		RA-1312-1				
	Includes items		396 to 401				
387	Flange, fuel line		W-144				
388	Flange, fuel tank filler		RA-313				
389	Cap, fuel tank	18029					
390	Head, fuel tank		RA-379-A				
391	Sheet, fuel tank body		RA-429-C				
392	Tank, fuel			29034	C-411-P		C-411-P.
393	Pipe, fuel		RA-115-B				
394	Sleeve, compression coupling		60-F-3/16				
395	Nut, compression coupling		61-F-3/16				
396	Cap, fuel tank		RA-312	60961	01-822		01-822.
397	Washer, fuel tank cap		RA-311				
398	Screen, fuel tank cap		RA-314				
399	Chain, fuel tank cap		RA-302				
400	Pin, cotter, 3/32 x 5/8"		6-P-05				
401	Cross bar, fuel tank cap		RA-535				
402	Bracket, fuel tank		RA-324-B	61486	21198		21198.
403	Strap, fuel tank		RA-400-A	69298	69298		69298.
404	Screw, fuel tank strap		4-G-05				
405	Screw, fuel tank bracket		4-G-05	91229	92147		92147.
406	Lock washer, fuel tank bracket screw		4-W	90683	90683		90683.
407	Nut and bolt, fuel tank strap			91568	91568		91568.
ak	Base assembly		RA-1015-5				
	Includes items		408 to 416				
al	Crankcase end plate assembly		RA-1064-4				
	Includes items		419, 420				
am	Main bearing housing assembly		RA-1109-4				
	Includes items		417, 418				
408	Pan, oil splash		RA-193				

[1] Denotes an oversize repair item which is not required except when replacing to compensate for wear in other parts.

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		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
409	Base		RA-15-H	61473	61473	61473.
410	Studs, crankcase to base		RA-68-A			
411	Ell, street, ¾"		6-AC			
412	Plug, oil drain pipe, ¼"		2-Z	90878	90878	90878.
413	Plug, oil filler pipe, ¾"		6-Z	90886	90886	90886.
414	Screw, base		5-C-06			
415	Lock washer, base screw		5-W			
416	Screw, round head cap		4-V-06			
417	Housing, main bearing		RA-109-F			
418	Cup, bearing		RA-427			
419	Cup, bearing		RA-427			
420	Plate, crankcase end		RA-64-K			
421	Nut, base	11616				
422	Lock washer, base nut, upper	6540				
433	Lock washer, base nut, lower	11679				
424	Foot	10502				
425	Stud, crankcase side plate		RA-68-A			
426	Gasket, crankcase and plate		RA-121-A			
427	Gasket, main bearing housing		RA-126			
428	Gasket, base		RA-132-B	66987	66987	66987.
429	Gasket, crankcase end plate (thin)		RA-246-A			
430	Gasket, breather body		RA-397-A			
431	Nut, crankcase end plate and bearing housing		5-K			
432	Lock washer, crankcase end plate and bearing housing nut.		5-W			
433	Screw, breather		4-G-112			
434	Lock washer, breather screw		4-W			
435	Washer, oil seal		RA-167-A	99175	99175	99175.
436	Nipple, oil filler			91523	91523	91523.
437	Cap, oil filler			69345	69345	69345.
438	Bearing, ball	11266		99157	99157	99157.

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439	Screw, base			90887	90887		90887.
440	Lock washer, base screw			92268	92268		92268.
441	Ring, main bearing retainer	11267					
442	Washer, cork, main bearing	11271					
443	Facing, cork, main bearing	11377					
444	Gasket, crankcase back plate	11089					
445	Screw, crankcase	10491					
446	Lock washer, crankcase screw	10485					
an	Blower housing assembly		RA-2014-5				
	Includes items		447 to 455				
ao	Stop switch assembly		RA-1179				
	Includes items		453 to 455				
ap	Blower housing back plate assembly complete		RA-2101-2				
	Includes items		456 to 459				
aq	Blower housing back plate assembly		RA-1101-2				
	Includes items		456, 457				
447	Flywheel and blower		23126	61451	61451		61451.
448	Bare blower housing assembly		RA-1104-5				
449	Housing, blower		RA-104-C	29098	99929		99929.
450	Plate, tapping		RA-499				
451	Deflector, air		RA-289-A				
452	Rivets, switch spring		1-AL				
453	Button, stop switch		RA-179				
454	Grommet		RA-488				
455	Spring, stop switch		RA-180				
456	Plate, blower housing, back		RA-101-F				
457	Plate, tapping		RA-499				
457A	Nut, switch screw		8-32-AG				
457B	Bushing, switch insulating		RA-91				
458	Washer, switch insulator		RA-92				
459	Screw, switch		8-32-V-20				
460	Screw, blower housing	11595		92272	92272		92272.
461	Lock washer, blower housing screw	H-169		90386	90386		90386.
462	Screw, handle	11674					
463	Lock washer, handle screw	H-169					
464	Screw, Parker-Kalon, name plate		4-AO-4				
465	Plate, name		RA-492				
466	Cover, blower housing		RA-120-A				
467	Bracket, blower housing mounting			62177	62177		62177.
468	Screw, blower housing mounting			90916	90916		90916.

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A	B	C	D	E	F	G
Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43	PE-HE-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
469	Lock washer, blower housing mounting screw			90832	90832	90832.
470	Screen, blower			62347	62347	62347.
471	Rivet, blower screen			36436	36436	36436.
472	Puller, flywheel			29157	29157	29157.
473	Lock washer, adjusting screw	10485				
474	Coil, 32 volt	11650				
475	Nut, molded	15070				
ar	Muffler assembly		RA-1002	89567	89567	89567.
	Includes items		476 to 480			
476	Plate, muffler inlet		WM-1			
477	Plate, muffler outlet		WM-2			
478	Coupling, muffler		RA-443			
479	Rivet		3-AL			
480	Burr		7-AM			
481	Elbow, muffler			91205	91205	91205.
482	Muffler	18015				
483	Lock nut, muffler elbow			91242	91242	91242.
484	Nipple, muffler		RA-483	91245	91245	91245.
485	Rope, starting	11408		66979	66979	66979.
486	Pulley, rope starter		RA-264-A	61492	61492	61492.
487	Pin, starter pulley	10535				
488	Screw, starter pulley	11598				
489	Washer, pulley screw	11599				
490	Nut, extension, starter pulley		RA-263-A			
491	Nut, starter pulley		9-K			
492	Screw, engine end cover	10495				
493	Lock washer, engine end cover screw	10485				
as	Generator terminal panel assembly	15010				
	Includes items	494, 495				
494	Receptacle	15100		10108	10108	10108.
495	Nut, molded terminal	15071				

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496	Screw, mounting	10491					
497	Lock washer, mounting screw	10485					
498	Panel, terminal (blank)			SC-30	C-669-A		C-669-A.
499	Bracket, terminal panel, left hand			SC-35	C-394-E		C-394-E.
500	Bracket, terminal panel, right hand			SC-34	C-394-D		C-394-D.
501	Cable, negative, long	11590					
502	Cable, positive, short	11589					
503	Cable, regulator to terminal plate	15051					
504	Regulator, voltage, 32 volt	15230					
505	Binding post, terminal			45	45		45.
at	Armature assembly	10758		G-3596	G-3596		G-3596.
	Includes items	506, 507					
506	Armature	15155					
507	Fan and bushing assembly			G-3597	G-3597		G-3597.
au	Field frame and coil assembly	10766					
	Includes items		508, 509				
508	Casting, field frame			P-5746	P-5746		P-5746.
509	Coil assembly, field			G-3599	G-3599		G-3599.
510	Shoe assembly, pole			G-1610	G-1610		G-1610.
511	Retainer, field pole			P-2317	P-2317		P-2317.
512	Screw, field pole retainer			P-5592	P-5592		P-5592.
513	Lock washer, field pole retainer screw			P-5593	P-5593		P-5593.
514	Grommet, insulating			GR-A-5848	GR-A-5848		GR-A-5848.
av	Brush assembly	11476					
	Includes items	515, 516					
515	Spring, generator brush	H-193					
516	Lead, brush	15048		G-2963	G-2963		G-2963.
517	Holder, brush	15120		G-3731	G-3731		G-3731.
518	Screw, brush holder			P-4581	P-4581		P-4581.
519	Screw, brush terminal			P-5763	P-5763		P-5763.
520	Lead and lug assembly (jumper)			G-2884	G-2884		G-2884.
521	Retainer brush			P-1886	P-1886		P-1886.
522	Lock washer, brush holder screw			P-3852	P-3852		P-3852.
523	Lock washer, brush terminal screw			P-3515	P-3515		P-3515.
524	Screw, end plate	10794					
525	Washer, brass, plain	15142					
526	Washer, insulating fiber	15143					
527	Ring, insulating	10786					
528	Nut, binding post	15032					
529	Lock washer, end plate screw	H-169					

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A	B	C	D	E	F	G
Item reference No.	Name of item	PE-HA-43	PE-HB-43	PE-HC-43	PE-HD-43	PE-HE-43
		Homelite Corporation, Port Chester, N. Y.	United States Motors Corporation, Oshkosh, Wis.		Climax Engineering Corporation, Clinton, Iowa	
530	Bearing	H-154				
531	Bushing, insulating	H-305				
532	Cover, generator			P-5743	P-5743	P-5743.
533	Cover, generator end			P-5744	P-5744	P-5744.
534	Screw, end cover	10497		P-5734	P-5734	P-5734.
535	Lock washer, end cover screw	10485		P-3515	P-3515	P-3515.
536	Adapter, generator			P-I-550-A	C-641-L	C-641-L.
537	Screw, shell			P-5734	P-5734	P-5734.
538	Lock washer, shell screw			P-3852	P-3852	P-3852.
539	Bushing, shell screw			P-5745	P-5745	P-5745.
540	Crate assembly			SC-33	C-645-B	C-645-B.
541	Skid base assembly			SC-31	C-576-G	C-576-G.
542	Mounting, rubber			DA-1090-70	DA-1090	DA-1090.
543	Handle, crate			2082-J-4	108	108.
544	Bolt, clamp, with latch			240		
545	Lever bolt, upper part				240-U	240-U.
546	Lever bolt, lower part				240-L	240-L.
547	Butt, tool box cover hook			719-M		
548	Gate hook and eye, tool box cover			40-M-9		
549	Hinge, tool box cover			12		
550	Scraper, carbon	11479				
551	Wrench, double end (Armstrong)	25-A				
552	Wrench, socket	10865				

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A Item	B Part name	BD-LL-61 Number required	BD-LM-61 BD-LN-61 BD-LO-61 BD-LP-61 Number required
	aw. Panel BD-61		
553	Panel board	1	1
554	Voltmeter IF-47 (0-50 volts, d-c)	1	1
555	Ammeter IF-16 (0-10 amperes, d-c)	3	3
556	Contactor switch (3-pole)	1	1
557	Automatic switch (reverse current relay)	1	1
558	Binding posts (No. 14-20 brass, with wing nuts and washers)	8	8
559	Phenolic stand-offs for binding posts (1 inch high)		8
560	Knife switches, double-pole single-throw, 125-volt, 15-ampere, each with two 15-ampere fuses and fuse clips	3	
561	Circuit-breakers, 0322-10, Heinemann Electric Co., Trenton, N. J., or equal		3
562	Rheostats, 12.5 ohms (approx.); 12-ampere capacity on first step, tapering to 3.4 amperes in 33 or more steps (Ward Leonard E. D. 28890 or equal)	3	3
563	Wire, stranded copper, equivalent to No. 12 A. W. G., rubber insulated and braided.		
564	Screws, brass, black nickel finish, peined over to prevent loosening, except parkerized steel screws holding panel in cabinet.		

ax. The following items are not issued with the set but are desirable accessories:
1 can, 1-gallon, with flexible spout.
1 cup, measuring ½ pint (PE-HA-43).
1 oiler, small (1 additional oiler for priming with PE-HA-43).

[A. G. 062.11 (5-9-41).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

E. S. ADAMS,
Major General,
The Adjutant General.

DISTRIBUTION:

B2 (2); IR 2, 4 (2); IBn 4, 6, 11 (3); IC 2, 4, 6, 11 (3).
(For explanation of symbols see FM 21-6.)

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